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Does Merger and Acquisition Activity Play a Role in The Pre-Existing Healthcare Initiatives of Improved Quality and Decreased Costs Highlighted by The Affordable Care Act?

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Does Merger and Acquisition Activity Play a Role in The Pre-Existing Healthcare Initiatives of Improved Quality and Decreased Costs Highlighted by The Affordable Care Act?

by

Dawn Constance Mckell

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ACCEPTANCE

This dissertation was prepared under the direction of the *DAWN MCKELL* Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Business Administration in the J. Mack Robinson College of Business of Georgia State University.

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Dawn C. Gilfillan-McKell

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Does Merger and Acquisition Activity Play a Role in The Pre-Existing Healthcare Initiatives of Improved Quality and Decreased Costs Highlighted by The Affordable Care Act?

by

Dawn Constance Mckell

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This is a quantitative study of archival data that examines Merger and Acquisition (M&A) activity using currently established healthcare quality and financial performance metrics. The research seeks to explicate the relationship between M&A activity and M&A experience in the healthcare industry as it relates to initiatives aimed at improving the quality and decreasing the cost of healthcare. The Affordable Care Act (ACA) legislation appears to be contributing to a trend toward M&A consolidation; by illuminating how this trend potentially impacts healthcare quality and cost reduction initiatives, this study's contribution is both useful and practical. The units of analysis are Medicare reporting hospitals, hospital systems, and related healthcare providers that have or have not experienced an M&A or multiple M&As.

The study shows a statistically significant improvement in quality each year from 2006–2014, which is reflected in higher scores for the four quality metrics measured. M&A activity, as measured by acquisition status and acquirer experience, did not appear to influence these quality metrics, with the exception of the heart failure measure, which

showed a statistically significant positive influence of acquirer experience across all specifications.

M&A activity's possible effects on hospital financial performance was assessed through operating-cost-to-charge and capital-cost-to-charge ratios (CCRs). The operating CCR appears to be positively influenced by both acquisition status and acquirer experience, while the capital CCR was positively influenced only by acquirer experience. A positive influence is reflected in a decreasing ratio.

Results on quality improvement over time, both before and after the ACA, suggest that the ACA itself may not be *the* driver for quality improvement. Similarly, decreases in OCCR occurred consistently and statistically significantly over time, both pre- and post-ACA, while CCCR showed statistically significant decreases in 2006–2008, 2013, and 2014. These results appear to support the notion that the trend was ongoing before the ACA was enacted and gave these measures high-profile exposure.

INDEX WORDS: Hospitals, Hospital consolidation, Mergers and Acquisitions, M&A, Patient Protection and Affordable Care Act, ACA, Accountable Care Organization, ACO, Healthcare system, Organizational learning theory, EMR, Cost-to-charge ratio, Inpatient charges, Outpatient charges

I.INTRODUCTION

I.1 Healthcare in the United States

The current state of healthcare in the United States (US) is troublesome; the US spends more on healthcare per person than any other nation and more than two-and-half times what other developed nations spend (Kane, 2012) (Munro, 2015). Citing the US Centers for Medicare and Medicaid Services (CMS), Munro (2015) projected that the National Healthcare Expenditure (NHE) would "hit $3.207 trillion" in 2015, or $10,000 per capita for the US population of approximately 320 million (Munro, 2015). In 2014, spending was $9,523 per capita, or 17.5 percent of the US gross domestic product (GDP) (Government, 2014). Yet, despite this generous spending, based on 2013 data from 11 countries, the US ranks at the bottom when it comes to its overall health rankings on quality of care, access to care, efficiency, equity, and healthy lives (Davis, Stremikis, Squires, & Schoen, 2014, p. 7). These findings support earlier findings from 2004, 2006, 2007, and 2010 (Davis et al., 2014). To address this problem, the Affordable Care Act (ACA), also known as "Obamacare," was enacted in March 2010 and targeted three key healthcare factors: increasing access to care, improving the quality of care, and decreasing the cost. Since its enactment, the ACA is recognized as having contributed to both horizontal and vertical merger and acquisition (M&A) activity in the healthcare industry (Packer-Tursman, 2015). This M&A activity could be detrimental to the ACA's goals. On the other hand, the ACA encourages integrating activities through provisions such as Accountable Care Organizations (ACOs), which aim to enhance control of the continuum of care, and value-based purchasing, which prompts consolidation efforts to cover more patients and reduce risk. This study explores whether M&A activity is

associated with two of the ACA's three healthcare targets—improving quality and reducing costs—and, if so, whether the association is synergistic or antagonistic.

I.2 M&A Activity Behavior and Observed Associations

In general, the overarching goal of businesses that enter into the M&A arena has transformed from a desire to acquire new skills or perform new activities to a desire to realize "economies of scale" that are anticipated when companies in the same industry combine. This latter type of M&A might also be entered into to achieve synergies between organizations (Marmenout, 2011).

It is well recognized that M&As occur in waves (Andrade, Mitchell, & Stafford, 2001; Haleblian, Devers, McNamara, Carpenter, & Davison, 2009; Mitchell & Mulherin, 1996), and that the waves themselves are clustered within given industries (Mitchell & Mulherin, 1996). In 2012 and 2013, the global value of M&As across industries was US$2.6 and US$2.4 trillion, respectively (Thomson-Reuters, 2012, 2013), yet abundant evidence shows that the results of M&As, based on expected performance, can be disappointing (Gomes, Angwin, Weber, & Tarba, 2013). In general, M&A studies deliver mixed results when tested by improvements to shareholder value (Tuch & O'Sullivan, 2007). Half of M&As in the US and 70 percent of international M&As do not meet expectations and are therefore considered unsuccessful (Aguilera & Dencker, 2004). This information is supported by other reports on the high failure rate of M&As as cited in Stahl et al. (2013, p. 335, para 2) and others (Tuch & O'Sullivan, 2007). This phenomenon belies the repeated waves of M&A activity across industries; the global, upward trend in the number (Barkema & Schijven, 2008) and scale of M&As; and the apparent willingness of organizations and their stakeholders to incur the high cost that

these ventures entail. Meta-analysis shows that strategic and financial variables are not significant when trying to predict post-acquisition success (King, Dalton, Daily, & Covin, 2004). Some studies have looked at the post M&A performance of the acquired versus the acquirer and have found that the acquirer suffers financially (Chatterjee, 1992; Datta, Pinches, & Narayanan, 1992; King et al., 2004; Moeller, Schlingemann, & Stulz, 2003; Seth, Song, & Pettit, 2002), while the acquired shows improved performance (Asquith & Kim, 1982; Datta et al., 1992; Hansen & Lott Jr, 1996; Malatesta, 1983).

In the US, M&A activity in the healthcare industry was second only to that in the energy industry in 2012 and 2014 (Thomson-Reuters). Packer-Tursman (2015, p.21, chart) ranked healthcare number one in M&A activity (19.5 percent) across the top 20 M&A,US industry business sectors. Healthcare industry M&As seem to follow general M&A trends. Hospital consolidations—a subset of healthcare industry M&As—experienced a wave in the 1990s (Vogt 2006). Although it has not been investigated as such, another hospital consolidation wave seems to be occurring now based on hospital M&A activity reports (Brown, Werling, Walker, Burgdorfer, & Shields, 2012; KPMG, 2015; Packer-Tursman, 2015; Sanders, 2015). Studies of hospital consolidation results have varied from mixed results (Cook, 2015; Dranove & Lindrooth, 2003; Krishnan & Krishnan, 2003) to cost savings that decrease over time (Harrison, 2011). Spang, Arnould, and Bazzoli (2009) point out that results "are very sensitive" to ownership, governance, and market structure. Cook (2015) reports lower net margins for both the acquired and the acquirer, with the acquirer experiencing higher patient margins post-acquisition. On the quality side, Mutter, Romano, and Wong (2011) found inconsistent

results when studying the association between hospital consolidation and quality using quality data from 16 states for 1999 and 2000.

Thus, the question is, given a sound business plan and thorough investigation of the organization to be acquired, why do so many M&As lead to outcomes that are below expectations? A prevailing thought here focuses on employee aspects, including morale, culture incongruence, and employee retention or turnover (Buono & Bowditch, 2003; d'Amours, 2010; Siehl & Smith, 1990). Marmenout (2011) suggests that, to achieve economies of scale, the new goal of M&As is greater integration of people, which in turn creates greater upheaval and uncertainty. Some argue that such upheaval and uncertainty impact both morale and turnover (Schweiger & Denisi, 1991; Seo & Hill, 2005). This line of thinking has generated considerable research on the human side of M&As. However, there has been less focus on the competence or experience of the executive team and/or the organization—though Johnson, Lenartowicz, and Apud (2006) do offer a model of cultural competence in international business.

The crux of the matter is that the ACA legislation seems to be contributing to a rise in M&A activity, yet we find little to support the value of such activity; indeed, significant research from other industries suggests that most M&As are unsuccessful when compared to their intended objectives.

I.3 Purpose of the Study

This research addresses two questions: What association, if any, does horizontal acquisition have with the quality of hospital inpatient care and hospital efficiency? Is any potential association mitigated or enhanced by prior acquisition experience on the part of the acquirer?

I.3.1 *Contribution to organizational learning theory.*

Simply put, organizational learning theory predicts that the more an organization repeats the same task, the better it will perform that task (Crossan, Maurer, & White, 2011). Another objective of my study is to peer through an organizational learning theory lens at M&A activity as it relates to the M&A experience of the acquiring entities. In a study based on panel data from 25 large Dutch multinational firms, Barkema and Schijven (2008) suggest that acquisition experience among members of the "top management team" might allow a firm to acquire more efficiently, but might also impede its ability to acquire more effectively by limiting its integration/restructuring activity. Integration intensity—i.e., the extent to which the acquiring firm incorporates the acquired firm into its operations at all levels and departments—has been shown to impact post-acquisition performance differentially based on whether the acquisition is focus increasing, as in horizontal M&As, or focus decreasing, as in vertical M&As. As cited in Daniliuc, Bilson, and Shailer (2014, p. 591), high integration intensity has proven beneficial when the acquisition's strategic objectives are focus-increasing economies of scale, efficiency, and synergy (Salter & Weinhold, 1981); however, such intensity might be detrimental to focus-decreasing strategies aimed at financing or diversification (Shrivastava, 1986; Vestring, Rouse, & Rovit, 2004). Given M&A activity's increasing emphasis on focus-increasing strategies (Marmenout, 2011), all of these findings suggest that acquisition experience might lead to an overemphasis on integration activities that is detrimental to achieving diversification goals (Barkema & Schijven, 2008). In general, outcomes measures such as integration intensity are consistent with focus-increasing strategic initiatives.

In the healthcare industry, M&A activity is occurring to consolidate hospitals—a focus-increasing strategy—while the M&A activity associated with the ACO structure being pursued is a focus-decreasing strategy. This might lead to the expectation that the acquirer's experience would be beneficial in M&As involving hospital consolidation. Results from the current study provide evidence to support organizational learning theory in the healthcare industry related to focus-increasing strategies, but it sheds no light on focus-decreasing strategies.

Economies of scale, margins, increased revenue, cost savings, and price decreases focus solely on financial performance measures. However, *value* in healthcare must consider quality care that drives patient outcomes. The increasing collection and publication of quality metrics within the healthcare industry suggest that quality is at least as important in the eyes of those who passed the legislation. Although quality metrics existed before the ACA, an emphasis on quality of care metrics is a key focus of the legislation. The ACA was signed into law by President Obama on March 23, 2010. The law was enacted to increase access to care, improve patient outcomes, and reduce the cost of care in the US (Whitehouse, 2012). The ACA has extended accountability for patient outcomes to a wider circle of providers who operate as a healthcare team. This has driven individual hospital, urgent care centers, community clinics, and physician's offices toward increased M&A activity (Packer-Tursman, 2015).

Several of the ACA payment reform initiatives are designed to push delivery systems to greater collaboration and integration. For example (and as stated earlier), the ACA includes provisions that encourage the formation of ACOs, and it offered financial incentives for early ACOs adopters. Thus, the M&A activity trend has been fueled in part

by two factors: the desire to achieve an ACO organizational structure, which is viewed as a best practice to address ACA initiatives; and the desire to gain control of the continuum of care. In addition, payment initiatives, such as value-based purchasing, prompt facilities to control more patient lives to reduce the risk of the higher healthcare costs associated with any one individual patient. Given the poor track record of M&As, it is important to learn how M&A activity might be associated with ACA initiatives so that practice and policy can be modified appropriately and organizational learning theory can be expanded.

A review of the literature indicates that researchers have yet to publish a comprehensive study of all US hospital M&A activity using quality measures and Medicare financial metrics as indicators. Previous studies have used the American Hospital Association (AHA) annual hospital survey (Cuellar & Gertier, 2005; Ho & Hamilton, 2000), hospital inpatient data (Hayford, 2012), and all payer administrative data (Mutter et al., 2011) to evaluate M&A activity's effect on quality. Further, the data sets used were pre-2007, which is before the ACA legislation was established, and the studies focused on a particular state, California (Hayford, 2012; Ho & Hamilton, 2000), a few states (Cuellar & Gertier, 2005), or a 16 state region, (Mutter et al., 2011). Thus, a gap in knowledge exists on the effect of M&As in the healthcare provider space, particularly as measured by the existing quality and efficiency metrics of performance and from a more current national standpoint. Bridging this gap is the final objective of this research.

In summary, this study attempts to fill gaps in the literature and provide evidence that might help elucidate the relationships between M&A activity in the healthcare space,

quality and cost of care, and the M&A experience across the US as represented by the conceptual framework and study hypotheses in sections I.4.1 and I.4.2 below.

I.3.2 *Contribution to practice*.

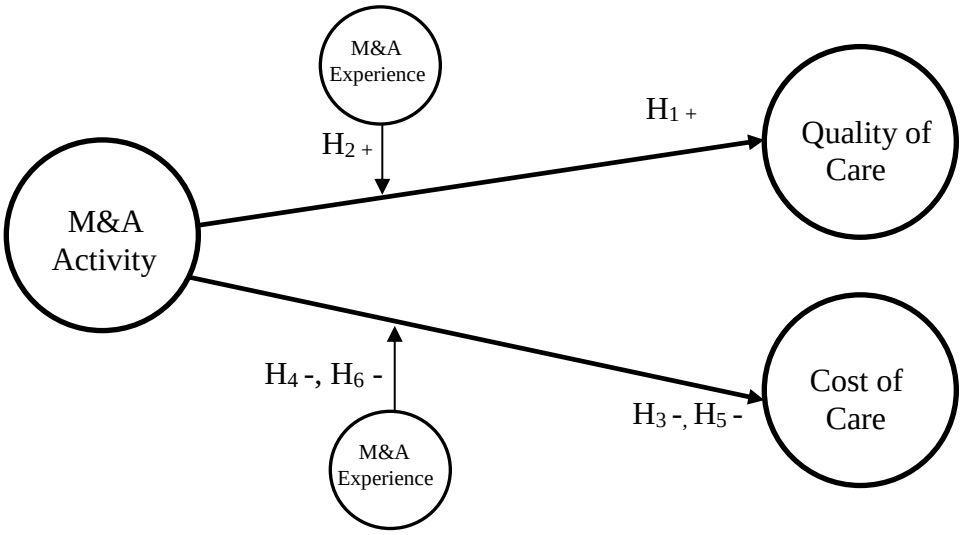
This study is focused on hospital-to-hospital M&As. Therefore, focus-decreasing strategies or vertical M&As—i.e., diversification, such as the acquisition of long term acute care (LTAC) facilities, home health, and pharmacy acquisitions—is an area for future research. Again, as has been noted elsewhere, the literature in this area has utilized the performance measures of cost savings, price decreases, and revenue increases (Cuellar & Gertier, 2005; Ho & Hamilton, 2000) using varying methods, such as text analysis (Cook, 2015) and case studies (Romano & Balan, 2011; Thompson 2009). Researchers have also evaluated economies of scale cost savings and margins pre- and post-acquisition (Dranove & Lindrooth, 2003; Harrison, 2011; Krishnan & Krishnan, 2003). In general, the measures are consistent with focus-increasing strategic initiatives, which a focal point of this research.

Again, given the poor track record of M&As, "it is important to learn how M&A activity might be associated with ACA initiatives so that practice and policy can be modified appropriately" (p.7). For practice, this research provides guidance based on associations between M&A transactions, experience, and performance results based on the healthcare industry's current performance markers.

I.4 Expected Results

I.4.1 *Conceptual framework.*

Figure 1 shows the study's conceptual framework and applied theory.



Organizational Learning Theory (H_2, H_4, H_6)

Figure 1 Conceptual Model
M&A activity, organizational learning, and expected results

I.4.2 *Hypotheses.*

Assuming that other possible influencers are controlled for, this study posits the following hypotheses.

Hypothesis 1: Hospital-to-hospital acquisition or merger will improve the acquired hospital's quality scores.

Hypothesis 2: When the acquirer has prior acquisition experience, the acquired hospital's quality scores will improve.

Hypothesis 3: Hospital operating cost-per-charge ratios will decrease for hospitals that have been acquired.

Hypothesis 4: Hospital operating cost-per-charge ratios will decrease for hospitals by an additional increment when the acquirer has prior acquisition experience.

Hypothesis 5: Hospital capital cost-per-charge ratios will decrease for hospitals that have been acquired.

Hypothesis 6: Hospital capital cost-per-charge ratios will decrease for hospitals by an additional increment when the acquirer has prior acquisition experience.

II.DATA ANALYSIS

To analyze unbalanced, archival panel data, I used Stata 14, applying descriptive statistics and a fixed effects multivariate regression statistical analysis with robust variance estimates and clustering around a unique identifier for each hospital.

II.1 Research Methodology

This analysis was conducted by assembling data on hospital characteristics for a 10-year period (2005–2014). Most of this data was obtained from CMS.gov. M&A data was obtained from Bloomberg's database, which contains information about M&As associated with both public and private healthcare providers; it also includes specifics on ownership, type of transaction, and other demographics. News sources related to public M&A announcements were used to determine the identify of individual hospitals when Bloomberg listed the transaction as "all assets of" and/or the listing contained only the number of hospitals acquired. Billian's HealthData database (BHD) hospital identification numbers (bhid) were used as a unique identifier for each hospital reporting. This was essential, as many hospital provider numbers changed over time as hospitals transitioned to critical access sites. BHD's hospital demographics were used to match the multiple providers to the bhid. The dependent variables are from the Medicare.gov and Centers for Medicare and Medicare Services (CMS) websites. Medicare.gov has four categories of measures—process, outcome, patient experience, and structure—for a total of 32 quality metrics that cover the quality of care in various disease states and quality improvement initiatives. Medicare quality metrics also changed over the study period. Here, I focus on four of the timely and effective care process measures because they were retained with the same description across the 10-year study period. Likewise, I use cost metrics from the CMS. It's important to note that the quality results described here

pertain only to the quality measures studied; results may vary when other quality measures—such as patient satisfaction or population health outcome—are examined.

II.2 Data Sets

M&A data was obtained from the Bloomberg database on US hospital-related M&A transactions from 2005 to 2014. I used BHD to match provider numbers to the appropriate unique hospital identifier, as many hospitals used multiple provider numbers over the study period. Medicare.gov was the source for hospital-reported quality metrics (all US hospitals) from 2005 to 2014, while operating and capital cost-to-charge ratios were obtained from cms.gov. The ratios are calculated by dividing total hospital operating or capital costs by the sum of inpatient and outpatient charges.

II.2.1 *Billians HealthData data.*

Individual hospitals, integrated healthcare networks (IDNs), ACOs, health systems (HSs), and group purchasing organizations (GPO) data sets were downloaded from the BHD for hospital and healthcare market research at www.billianshealthdata.com. Table 1 shows 2015 BHD definitions for GPOs, IDNs, and HSs. For this study, these facility types were individually researched to identify the acquired's and the acquirer's facility type at the time of the M&A transaction.

Table 1 Type of Facility Definitions
Definitions of healthcare providers other than single hospital entities

Tag	Definition
IDN	An IDN is a network that includes the entire continuum of care. It is geographic in nature and includes hospitals, nursing homes, assisted-living facilities, pharmacies, clinics, and outpatient clinics. It is the often called *the birth to death scenario*.
ACO	An ACO is a healthcare organization characterized by a payment and care delivery model that seeks to tie provider reimbursements to quality metrics and reductions in the total cost of care for an assigned patient population. An ACO includes doctors, hospitals, and other health care providers.
HS	A healthcare system is not necessarily geographic in nature and it includes only hospitals.
GPO	A GPO is created to leverage the collective buying power of a group of businesses using volume to receive higher discounts from vendors.

Hospital demographics included in the data sets are found in Appendix A.1—Billians Health Data Demographics. I used these data sets to assign bhid to acquired and acquiring hospitals, IDNs, ACOs, HSs, and GPOs. I used "Multi-hospital" to tag transactions that involved more than one acquired hospital when the hospitals were not part of any of the identified provider groups. I used "Hospital" to tag the acquirer when the acquirer was a standalone hospital. These distinctions created two dummy variables: in the first, 0 = a single hospital acquisition and 1 = multi-hospital transaction; in the second, 0 = a hospital or multi-hospital acquirer that was not identified as an HS, IDN, ACO, or GPO, and 1 = an acquirer that was identified as an HS, IDN, ACO, or GPO.

II.2.2 *Bloomberg data.*

Data was extracted from Bloomberg using four criteria— "MA," "Consumer Non-cyclical," "Healthcare Services," and "Medical–Hospital"—and entered into an Excel spreadsheet. Information for each transaction included deal type, announce date, target name, acquirer and seller names, announced total value (in millions, when available), payment type, total value over earnings before interest, taxes and amortization

(TV/EBITA), and deal status. The Bloomberg data did not contain the TV/EBITA data for all transactions, but this variable was not used in the study. The initial data set contained 820 observations, each reflecting an acquisition or merger during the study period. Each line item was compared to a BHD data set that included all hospitals in the BHD to assign the current, appropriate bhid to both the target and the acquirer. During this process, I recognized that some Bloomberg line items were transactions that included multiple hospital and health system purchases. I therefore expanded these lines so that each hospital had its own line, with the appropriate bhid. The transaction date and all other Bloomberg data were copied into the new lines. It was often necessary to research the acquisition announcements to ensure that the correct identifier was assigned to each hospital. As described earlier, I added an additional demographic to tag individual hospital transactions, versus multi-hospital and health system transactions. Currently closed hospitals were also noted. Data cleanup included the removal of investment (INV) and joint venture (JV) transactions, transactions that were withdrawn or terminated, and transactions that did not include general, medical, or surgical hospitals or health systems with general, medical, or surgical hospitals—that is, I omitted transactions that only included Long term acute care (LTAC) facilities, skilled nursing facilities (SNFs), or specialty hospitals. Additionally, I removed transactions that were completed by purchasers that were not IDNs, ACOs, HSs, GPOs, or standalone general, medical, or surgical hospitals. After these edits, the final data set included 302 hospital mergers or acquisitions.

II.2.3 *Data accuracy checks.*

Individual searches were triangulated with BHD and Bloomberg data as to what was and was not a health care system, ACO, GPO, or IDN. Searches were conducted on acquisition announcements to verify Bloomberg data and identify individual hospitals when Bloomberg identified the acquisition as a multi-site acquisition. Finally, I researched acquisitions to find out whether or not facilities considered the transaction a merger or joint venture.

II.2.4 *Medicare data—quality.*

Medicare.gov data from 2005 to 2014 were downloaded from https://data.medicare.gov/data/hospital-compare (see Table 2).

Table 2 Medicare Data Files Content
Data categories from Medicare data files

Hospital—general information
Structural measures
Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction survey
Healthcare associated infections
Timely and effective care (TEC)
Readmissions, complications, and deaths
Readmissions reduction
Outpatient imaging efficiency
Medicare volume
Medicare spending per patient
Medicare spending per patient

Demographics and measures included in the data sets can be found in Appendix A.2—Medicare Data Set Demographics. Acronyms used in the measure names are listed in Appendix A.3—Medicare Acronyms, while each data set's components are listed in Appendix A.4—Medicare Data Set Components. The timely and effective care (TEC) measures can be found in Appendix A.5—Medicare Data Set Components—Timely and

Effective Care. Note that not all TEC measures are available for all years. I used only those variables that were reported consistently year-to-year, which left one variable for each of four disease or prevention categories—heart attack, heart failure, pneumonia, and surgical infection prevention—defined below. The surgical infection measure reporting was discontinued during the final year of the study. The master data set compiled the hospital provider information by hospital identifier and year; Table 3 below describes the variables, which are further described in Chapter III, Results.

Table 3 Study Variables – Protocol and Data Sources

Dependent and independent variables

Variable Type	Variable Name	Variable Description	Origin of Measure	Source:	Years Available	Comments:
Dependent Variables	*Ami 8a Score*	Heart attack treatment quality measure	Percent of patients given percutaneous coronary intervention (PCI) within 120 minutes of arrival (or 90 minutes from 2008 on)	Medicare Compare	2005–2014	Data taken from source
	HF_1 Score	Heart failure treatment quality measure	Percent of patients given discharge instructions	Medicare Compare	2005–2014	Data taken from source
	PN_6 Score	Pneumonia treatment quality measure	Percent of patients given the most appropriate initial antibiotic(s)	Medicare Compare	2005–2014	Data taken from source
	SCIP_INF_1 Score	Surgical infection prevention quality measure	Percent of patients given antibiotics 1 hour before surgical incision	Medicare Compare	2005–2013	This measure was dropped in 2014
	CCCR	Capital cost-to-charge ratio efficiency measure	Capital investments divided by total inpatient and outpatient charges	CMS Impact Files	2005–2014 (VA is not in the data set; it does not report this)	Data taken from source
	OCCR	Operating cost-to-charge ratio efficiency measure	Operating costs divided by total inpatient and outpatient charges	CMS Impact Files	2005–2014 (VA is not in the data set; it does not report this)	Data taken from source
Independent Variables of Interest	*Acquired*	Hospital acquisition status	One variable. Never acquired = 0; Acquired = 1; variable becomes 1 after acquisition and remains 1 for subsequent study years	Bloomberg and individual, personal web research on the acquirers and the acquisition	2005–2014	M&A transactions with acquisition dates
	Acquirer experience	Acquirer with at least one acquisition prior to the current event and during the study period	One variable. No experience = 0; At least one prior acquisition = 1	Bloomberg and individual personal web research on the acquirers and the acquisition	2005–2014	M&A transactions with acquisition dates
Independent Variables—Controls	*Hospital ID*	Medicare provider identification number and Billians HealthData ID (bhid)	Identification numbers used to link quality and efficiency reports back to the appropriate hospital	Medicare reports and Billians HealthData database	2015: bhid; 2005–2014: provider numbers	bhid used to associate single hospital with multiple provider numbers
	Total beds	Total number of hospital beds	Total number of hospitals beds listed on the certificate of need	CMS Provider of Service files	2006–2014	Data taken from source—used log10 transformation
	Type of deal—single entity acquisition/multiple	Transaction was the purchase of a single hospital or multiple hospitals	One variable. Single hospital acquisition = 0; Multiple hospital acquisition = 1	Bloomberg and individual personal web research on the acquirers and the acquisitions	2005–2014	Data taken from source
	Type of acquirer—single entity acquirer/health system or larger	Acquirer was a single hospital versus a hospital system or larger	One variable. Single hospital acquirer = 0; Health system or larger acquirer = 1	Bloomberg and individual personal web research on the acquirers and the acquisitions	2005–2014	Data taken from source
	Acute care	Hospital type		CMS Hospital Data	2005–2014	Data taken from source
	Population percent urban	Percent of population living in an urban area by county	Numerical value	US Census Bureau	2010	Data taken from source
	Acquired population percent urban*	Interaction term	Interaction term between categorical "acquired" variable and continuous population percent variable			Interaction term—created in Stata 14
	Government—federal	Hospital ownership		CMS Hospital Data	2005–2014	Data taken from source
	Government—hospital district or authority	Hospital ownership		CMS Hospital Data	2005–2014	Data taken from source—omitted variable
	Government—local	Hospital ownership		CMS Hospital Data	2005–2014	Data taken from source
	Government—state	Hospital ownership		CMS Hospital Data	2005–2014	Data taken from source
	Proprietary	Hospital ownership		CMS Hospital Data	2005–2014	Data taken from source
	Teaching	Affiliated with a resident program	One variable. Hospital with no Graduate Medical Education (GME) Part A payments = 0; Hospital with Graduate Medical Education (GME) Part A payments = 1	CMS Cost Reports	2006–2014	Data taken from source and converted to dummy variable
	Voluntary nonprofit—Other	Hospital ownership		CMS Hospital Data	2005–2014	Data taken from source—omitted variable
	Voluntary nonprofit—Private	Hospital ownership		CMS Hospital Data	2005–2014	Data taken from source

If hospitals had changed names and/or provider ID numbers, I used the initial provider number to identify the new hospital name and/or provider ID. Typically, this information came from the American Hospital Directory at www.aha.com. Another source of this information was www.cms.gov. I then checked the new hospital name and/or provider ID against the hospital name, provider ID, and/or address in the BHD. For purposes of this study, I considered hospitals "Closed" when they no longer qualified as acute care facilities—that is, they had been converted to surgical or urgent care centers and no longer provided services for inpatients. This resulted in unbalanced panel data as not every hospital has data for the full 10-year study period. As I stated earlier and as Figure 2 shows, fewer TEC measures exist in the early years, but they gradually increased before decreasing precipitously in 2013 as measures were added in other areas.

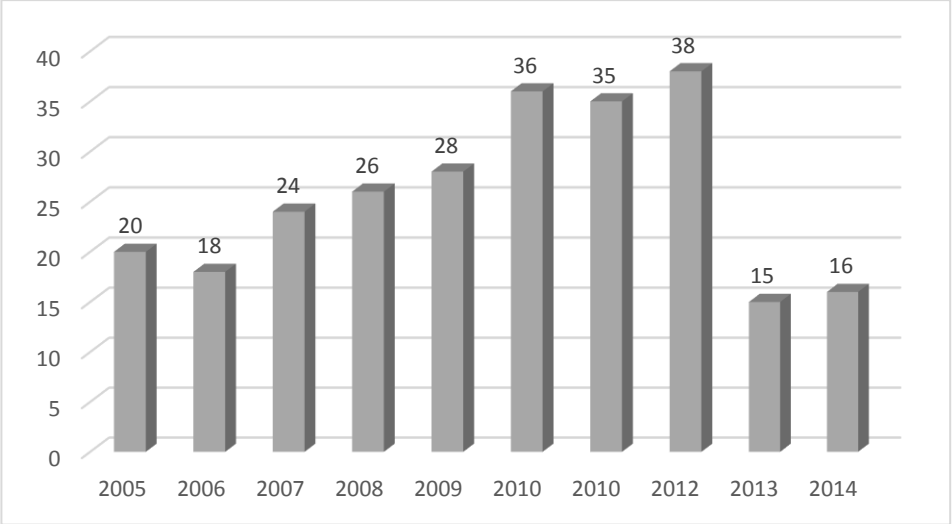


Figure 2 Number of Timely and Effective Care Measures by Year
The number of timely and effective care (TEC) measures over time

II.2.5 *Medicare data—financial.*

Financial data was obtained from CMS Cost Reports at www.cms.gov. These cost reports include hospital demographic information such as urban versus rural location, number of beds, type of hospital, and whether or not the hospital is a teaching facility. I obtained inpatient and outpatient hospital charges and total hospital cost data from CMS CSTS_CHRGS Reports by year. Teaching hospitals were identified as those receiving Graduate Medical Education (GME) payments using the CMS IME_GME 2005–2014 reports. The hospital operating cost-to-charge and capital cost-to-charge ratios for each year were obtained from the CMS Final Rule Impact report (FY_yr?_FR_Impact_File). A list of all data available in the CMS cost reports and impact files can be found in Appendix A.6—Centers for Medicare and Medicaid Services (CMS) Reports.

II.2.6 *Percent of urbanized population data.*

As an external control, I include a measure of urbanization. The percent urbanized population data was obtained from the 2010 United States Census found at https://www.census.gov/geo/reference/ua/ualists_layout.html. I matched the data to the appropriate bhid by county name and state.

II.3 Data Compilation

To analyze the data, I used Stata version 14. Variables included in the study and their nature are listed in Table 4 below. I also created dummy variables for each year (2006–2014) in which 0 equaled the data point that did not come from that year, and 1 equaled the data point that did come from that year. No dummy variable was included for 2010.

III.RESULTS

Table 4 contains the variable names, descriptions, and the nature of the data. I then present the results of the descriptive statistics analysis of the data, followed by the fixed-effect, multivariate regression analyses of the dependent variables.

Table 4 Description and Nature of the Variables
The nature of the study data

Variable Name	Variable Description	Nature of Data
ami 8a	Heart attack treatment	Percent score
hf_1	Heart failure treatment	Percent score
pn_6	Pneumonia treatment	Percent score
scip_inf_1	Surgical infection prevention	Percent score
Cccr	Capital cost-to-charge ratio	Ratio
Occr	Operating cost-to-charge ratio	Ratio
acquired	Hospital acquired at least once	Dummy variable
acqexp	Acquirer with at least one acquisition prior to the current event within the study period	Dummy variable
bhid	Billians HealthData ID	ID number used for clustering
lg10beds	Total number of hospital beds transformed by log 10	Continuous variable
typeofdeal	Transaction was the purchase of a single hospital or multiple hospitals	Dummy variable
acquirertype	Acquirer was a single hospital versus a hospital system or larger	Dummy variable
acute	Acute care hospital type	Dummy variable
poppct_urban	Percent of population living in an urban area by county	Continuous variable
IacqXpoppc_1	Interaction term—acquired x poppct_urban	Variable created in Stata 14
govfed	Federal government hospital ownership type	Dummy variable
Government—Hospital District or Authority	Federal government hospital ownership type	Omitted variable
govlocal	Local government hospital ownership type	Dummy variable
Govstate	State government hospital ownership type	Dummy variable
Proprietary	Proprietary hospital ownership type	Dummy variable
Gme	Proxy for teaching hospital type	Dummy variable
Volnpchurch	Voluntary nonprofit church hospital ownership type	Dummy variable
Voluntary nonprofit—Other	Voluntary nonprofit other hospital ownership type	Omitted variable
Volnpprivate	Voluntary nonprofit private hospital ownership type	Dummy variable

III.1 Descriptive Statistics

III.1.1 *Data Notes.*

Items of note that pertain to the data are listed below.

- The *acquired variable* was a 0 for the acquired hospital prior to acquisition and became 1 and remained 1 for each subsequent study year after acquisition.
- *Merger and acquisition experience* is defined as having acquired a hospital or multiple hospitals, within the study period, at least one year prior to the current M&A event.
- An *M&A event* is defined as the Bloomberg M&A announcement date.
- 2006–2013 Bloomberg M&A data was used in the study for the M&A experience variable.
- 2005 Bloomberg M&A data was used to determine the 2006 M&A experience.
- 2014 Bloomberg M&A data was not used in the study, because the M&A event's effect might not be evident in such a short time period.
- The study used four TEC quality metrics: heart attack (AMi 8a), heart attack, heart failure (HF-1_), pneumonia (PN_6), and surgical infection prevention (SCIP-inf-1). These four measures were chosen because they remained consistent throughout the study period, based on the measure definitions. The codes for the measures changed over time, but the basic definitions for the measures did not. Fortunately, there was consistent data on, and thus a measure for, each of the four clinical conditions (heart attack, heart failure, pneumonia, and surgical

infection) monitored for quality in the TEC portion of the ACA metrics. However, surgical infection prevention was not reported in 2014, so its study data runs from 2006–2013.

- Although TEC measures for 2005–2014 were collected, I did not use the data for 2005, as an examination of the frequencies suggested that a considerable number of hospitals may not have been reporting it correctly. Because this was the first year of reporting the measures, it was reasonable to conclude that reporting errors might be an issue.

III.1.2 *Descriptive statistical analysis.*

Table 5 offers a descriptive analysis of the variables. In addition to the categories listed, the "acute" category contained 41,401 observations, with 31,716 observations (76.6 percent) from acute hospitals and 9,685 observations (23.4 percent) from non-acute hospitals.

Table 5 Variables—Descriptive Statistics
Key study and control variables

Key Study Variables: Quality	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Heart attack treatment	13,408	80.60	21.87	0	100
Heart failure treatment	34,949	77.33	25.58	0	100
Pneumonia treatment	35,905	88.36	11.96	0	100
Surgical infection prevention	28,150	87.38	20.29	0	100
Key Study Variables: Cost-to-Charge Ratios	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Operating ratio	36,346	0.37	0.16	0	1
Capital ratio	36,337	0.03	0.02	0	0
Control Variables: Structure and Urbanization	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Percent of population that is urban	46,696	66.91	30.74	0	100
IacqXpopp~1 |- interaction term	41,118	1.49	11.10	0	100
log10 total hospital beds	43,922	2.01	0.52	0	3.39
Total number of hospital beds	43,922	192.61	231.48	1	2449

(Table continued on next page)

Control Variables of Interest			
acquired	**Freq.**	**Percent**	**Cum.**
0	43,996	98.03	98.03
1	882	1.97	100
Total	44,878	100	

acqexp	**Freq.**	**Percent**	**Cum.**
0	44,366	98.86	98.86
1	512	1.14	100
Total	44,878	100	

typeofdeal	**Freq.**	**Percent**	**Cum.**
0	44,364	98.85	98.85
1	514	1.15	100
Total	44,878	100	

acquirertype	**Freq.**	**Percent**	**Cum.**
0	44,350	98.82	98.82
1	528	1.18	100
Total	44,878	100	

Control Variables—Teaching Status and Ownership Type			
GME (teaching)	**Freq.**	**Percent**	**Cum.**
0	37,367	83.26	83.26
1	7,511	16.74	100
Total	44,878	100	
Government—federal	**Freq.**	**Percent**	**Cum.**
0	39,619	96.99	96.99
1	1,230	3.01	100
Total	40,849	100	
Government—local	**Freq.**	**Percent**	**Cum.**
0	37,237	91.16	91.16
1	3,612	8.84	100
Total	40,849	100	
Government—state	**Freq.**	**Percent**	**Cum.**
0	40,204	98.42	98.42
1	645	1.58	100
Total	40,849	100	

(Table continued on next page)

Control Variables—Teaching Status and Ownership Type (cont)			
Proprietary	**Freq.**	**Percent**	**Cum.**

0	33,946	83.1	83.1
1	6,903	16.9	100
Total	40,849	100	
Vol* nonprofit church	**Freq.**	**Percent**	**Cum.**
0	36,600	89.6	89.6
1	4,249	10.4	100
Total	40,849	100	
Vol* nonprofit private	**Freq.**	**Percent**	**Cum.**
0	27,377	67.02	67.02
1	13,472	32.98	100
Total	40,849	100	
***Vol = voluntary**			

Control Variables—Fixed Effects			
yr_2006	**Freq.**	**Percent**	**Cum.**
0	39,887	88.88	88.88
1	4,991	11.12	100
Total	44,878	100	
yr_2007	**Freq.**	**Percent**	**Cum.**
0	39,895	88.9	88.9
1	4,983	11.1	100
Total	44,878	100	
yr_2008	**Freq.**	**Percent**	**Cum.**
0	39,892	88.89	88.89
1	4,986	11.11	100
Total	44,878	100	
yr_2009	**Freq.**	**Percent**	**Cum.**
0	39,892	88.89	88.89
1	4,986	11.11	100
Total	44,878	100	
yr_2011	**Freq.**	**Percent**	**Cum.**
0	39,892	88.89	88.89
1	4,986	11.11	100
Total	44,878	100	
yr_2012	**Freq.**	**Percent**	**Cum.**
0	39,891	88.89	88.89
1	4,987	11.11	100
Total	44,878	100	
yr_2013	**Freq.**	**Percent**	**Cum.**
0	39,892	88.89	88.89
1	4,986	11.11	100
Total	44,878	100	
yr_2014	**Freq.**	**Percent**	**Cum.**
0	39,892	88.89	88.89
1	4,986	11.11	100
Total	44,878	100	

III.1.2.1 *Timely and effective care.*

Of the TEC measures, the pneumonia measure had the highest mean percentage score overall, followed by the surgical infection prevention measure, the heart attack measure, and the heart failure measure.

III.1.2.2 *Mergers and acquisitions.*

There was a total of 43,996 observed TEC score data points for hospitals that had never been acquired, comprising 98 percent of the data set. Of the total number of observations for acquired hospitals (882), the number of observations for hospitals whose acquirers had prior acquisition experience was 512 (58 percent) as outline in Table 5. In terms of the type of acquisition (deal) and acquirer type—where 0 is a single hospital acquisition or a single hospital acquirer, and 1 is a multiple hospital acquisition or a hospital system (or larger) acquirer—there were 514 observations for deal types that included multiple acquisitions in the transaction, and 528 observations whose acquirer had prior acquisition experience (as defined in III.1.1 above).

III.1.2.3 *Teaching status and type of ownership.*

Teaching hospitals represented 16.7 percent of the observations. For ownership type, observations were for federal government (3 percent), local government (8.8 percent), state government (1.6 percent), proprietary (16.9 percent), voluntary nonprofit church (10.9 percent), and voluntary nonprofit proprietary (33 percent). Two other ownership variables—government hospital district or authority ownership and voluntary nonprofit—were omitted.

III.1.2.4 *Year-to-year potential contribution.*

Table 5 also includes a list of the number of hospital scores that could contribute to the key study variables (TEC scores) for each year. These are the fixed-effect variables, and 2010 was omitted from the data set.

III.2 Bloomberg Data

Table 6 presents the M&A activity identified for 2005–2014.

Table 6 Hospital Merger and Acquisition Activity
M&A Activity 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Number of mergers per year	13	14	16	14	8	23	19	23	18	21	169
Total number of hospitals acquired per year	18	21	79*	16	9	39	25	30	36	29	302
Number of hospitals acquired by a health system or larger	16	21	79	11	8	34	20	25	34	27	275
Number of hospitals acquired in multi-hospital transactions	8	9	67	3	1	21	11	10	24	14	168

*Triad bought out by Community Health Systems (50 hospitals)

The data collected for the study period, 2005–2014, indicates that there were 169 transactions involving 302 hospitals. Hospitals that were acquired by a health system (or larger) acquirer composed 91.1 percent of hospitals acquired, and hospitals acquired in a multi-hospital acquisition transaction constituted 55.6 percent of the total number of hospitals acquired. In 2007, a large acquisition occurred when Triad Hospitals, Inc., was acquired by Community Health Systems for a reported $5.1 billion, with the assumption of $1.7 billion in debt (Reuters, 2007). This deal accounts for the spike in the number of hospitals acquired in the year-to-year pattern of mergers/number of hospitals acquired illustrated in Figure 3 below.

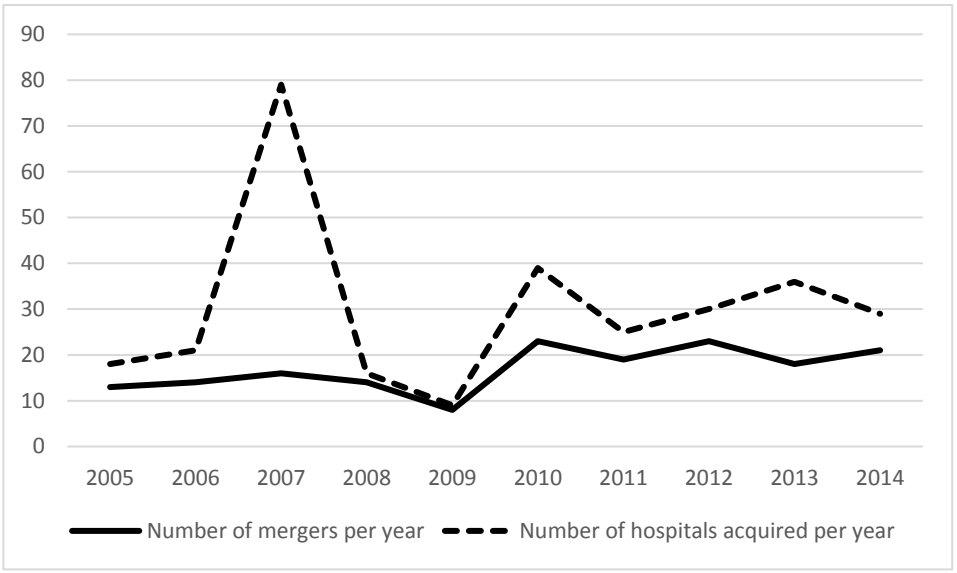


Figure 3 M&A Activity Trend
M&A activity 2005–2014

The number of M&As, year-to-year, shows a rise and fall pattern, with a precipitous dip in 2008–2009. An overall increasing trend is also exhibited.

III.3 Dependent Variables Fixed-Effects Multivariate Linear Regressions

The heart attack treatment metric in Table 7 below (and in Table 8, Table 11, and Table 12) reflects the linear regression models. These estimate the effect of the key study variables on quality measure scores with yearly fixed effects and robust variance estimates, clustered on hospital identifiers, using unbalanced panel data.

III.3.1 *Heart attack measure results.*

Note that the number of hospitals reporting the heart attack treatment metric is lower than the other quality metrics used in this study and identified previously. The scores reflect the percent of patients who received percutaneous coronary intervention (PCI; angioplasty) within the appropriate time widow.

Table 7 Linear Regression—Heart Attack Metric
Patients given PCI within 120 minutes of arrival (90 minutes from 2008 forward)

Linear Regression		
Number of obs	=	12,560
F(23, 1784)	=	196.18
Prob > F	=	0.000
R-squared	=	0.3928
Adj R-squared	=	0.3917
Root MSE	=	16.73

(Std. Err. adjusted for 1,785 clusters in bhid)

ami8a	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
acquired	-12.72662	11.79525	-1.08	0.281	-35.86058	10.40734
acqexp	-2.838257	3.225408	-0.88	0.379	-9.164232	3.487718
typeofdeal	5.554889	2.820259	1.97	**0.049**	0.023531	11.08625
acquirertype	1.059501	3.043925	0.35	0.728	-4.910533	7.029534
_IacqXpoppc_1	0.0724331	0.127966	0.57	0.571	-0.1785459	0.3234121
yr_2006	-20.60652	0.6750504	-30.53	**0.000**	-21.9305	-19.28255
yr_2007	-27.65433	0.6996349	-39.53	**0.000**	-29.02652	-26.28214
yr_2008	-18.27975	0.600212	-30.46	**0.000**	-19.45694	-17.10256
yr_2009	-8.332939	0.4950388	-16.83	**0.000**	-9.303855	-7.362022
yr_2011	2.288315	0.4096183	5.59	**0.000**	1.484933	3.091697
yr_2012	7.305264	0.430533	16.97	**0.000**	6.460862	8.149666
yr_2013	8.795362	0.4473937	19.66	**0.000**	7.917891	9.672833
yr_2014	9.769084	0.4324858	22.59	**0.000**	8.920852	10.61732
lg10beds	2.845558	1.083649	2.63	**0.009**	0.720203	4.970913
gme	-0.9318023	0.5607219	-1.66	0.097	-2.031543	0.1679385
acute	27.68363	5.323134	5.20	**0.000**	17.24339	38.12386
govfed	-3.20802	3.210428	-1.000	0.318	-9.504615	3.088576
govlocal	-2.964386	1.865703	-1.59	0.112	-6.62358	0.6948081
govstate	-7.28275	2.284713	-3.19	**0.001**	-11.76375	-2.801755
proprietary	-0.2696232	0.8801481	-0.31	0.759	-1.995853	1.456607
volnpchurch	0.9500298	0.8447864	1.12	0.261	-0.7068453	2.606905
volnpprivate	0.8178927	0.6893982	1.19	0.236	-0.5342202	2.170006
poppct_urban	0.0302107	0.0196375	1.54	0.124	-0.0083041	0.0687256
cons	48.74991	6.295224	7.74	0.000	36.40312	61.0967

As Table 7 shows, the number of heart attack measure score observations was 12,560. The linear model statistically significantly predicted the heart attack measure $F(23, 1784) = 196.18$, $p < .0001$, adj. $R^2 = 0.3917$. The independent variables of interest and the control variables contributed to the model as follows.

The independent variables of interest—the acquired and acquirer experiences—showed no statistically significant association with the rate at which hospitals comply

with the standard of care for heart attacks, i.e., neither the acquisition nor the acquirer's experience level appear to be associated with the heart attack quality measure score. As I mentioned in this section's introduction, the type of deal is associated with statistical significance in a positive direction at the $p = .049$ level.

Acute hospitals and state government hospitals also showed statistically significant differences for this measure, at the $p < .001$ and $p = .001$ levels, respectively, but the associations appear to be in a positive and negative direction. Table 7 shows the regression coefficients and robust standard errors.

III.3.2 *Heart failure measure results.*

The number of heart failure measure score observations was 32,424. As Table 8 shows, the linear model statistically significantly predicted the heart failure measure $F(23, 4322) = 313.27$, $p < .0001$, adj. $R^2 = 0.2980$. The independent variables of interest and the control variables contributed to the model as follows.

Table 8 Linear Regression—Heart Failure Metric
Patients given discharge instructions

Linear Regression		
Number of obs	=	32,424
F(23, 4322)	=	313.27
Prob > F	=	0.000
R-squared	=	0.2985
Adj R-squared	=	0.2980
Root MSE	=	21.24

(Std. Err. adjusted for 4,323 clusters in bhid)

hf_1	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
Acquired	-2.423556	6.025032	-0.400	0.688	-14.23571	9.388597
Acqexp	6.721845	1.792033	3.750	**0.000**	3.208541	10.23515
typeofdeal	0.7069767	1.458687	0.480	0.628	-2.152797	3.566751
acquirertype	2.310082	1.25887	1.840	0.067	-0.1579483	4.778113
_IacqXpoppc_1	-0.0144046	0.0586405	-0.250	0.806	-0.12937	0.1005608
yr_2006	-27.69362	0.5167001	-53.600	**0.000**	-28.70662	-26.68062
yr_2007	-16.78175	0.423625	-39.610	**0.000**	-17.61227	-15.95122
yr_2008	-11.60703	0.3833527	-30.280	**0.000**	-12.3586	-10.85546
yr_2009	-5.33518	0.326057	-16.360	**0.000**	-5.974419	-4.695941
yr_2011	2.466811	0.2484433	9.930	**0.000**	1.979734	2.953887
yr_2012	6.553876	0.3152296	20.790	**0.000**	5.935865	7.171888
yr_2013	8.567035	0.3357005	25.520	**0.000**	7.90889	9.22518
yr_2014	4.384875	0.4474191	9.800	**0.000**	3.507704	5.262046
lg10beds	14.64436	0.8958431	16.350	**0.000**	12.88805	16.40068
Gme	-2.720609	0.4824544	-5.640	**0.000**	-3.666467	-1.774751
Acute	0.6070405	1.026111	0.590	0.554	-1.404663	2.618744
Govfed	-5.900751	2.079944	-2.840	**0.005**	-9.978508	-1.822993
Govlocal	-1.845393	0.9914804	-1.860	0.063	-3.789204	0.098417
Govstate	-6.683951	2.181061	-3.060	**0.002**	-10.95995	-2.407953
proprietary	1.791398	0.6919657	2.590	**0.010**	0.4347904	3.148006
volnpchurch	4.867107	0.6662679	7.310	**0.000**	3.56088	6.173334
volnpprivate	2.363699	0.5563827	4.250	**0.000**	1.272903	3.454494
poppct_urban	0.0125811	0.0121725	1.03	0.301	-0.0112831	0.0364454
Cons	49.19412	1.468609	33.5	0.000	46.31489	52.07335

The heart failure measure results provide evidence of greater compliance with the measure associated with hospitals whose acquirers had experience with at least one

acquisition prior to the current acquisition ($p < .001$). This was the only TEC measure to show a consistent significant difference when it came to acquisition experience. The statistical significance seen for teaching status (gme), at the $p < .001$ level, would suggest that teaching hospitals would have lower scores on this measure. In contrast to the heart attack measure, the acute hospital variable exhibits no statistical significance related to the heart failure measure, but the state government variable remains statistically significant in the same negative direction (as seen for the heart attack metric) while federal government ownership becomes statistically significant, also in a negative direction, at the $p = .005$ level. Conversely, proprietary, voluntary not-for-profit church and voluntary not-for-profit private ownerships are statistically significant, in a positive direction, at the $p = .01$, $< .001$, and $< .001$ levels, respectively, while they were not significant with the heart attack measure.

After examining a correlation matrix that contained all of the target variables (see Appendix B.1 Correlation Matrix—All Variables) I found that both the type of deal and acquirer type variables had unacceptable levels of correlation to the acquired dependent variable. Further, the deal type variable alone correlated unacceptably to the acquisition experience variable. When the deal type variable was omitted, the statistically significant positive association of acquisition status with the heart failure measure was still present at the $p < .001$ level. Table 9 shows the full regression for the adjusted heart failure quality measure model. In the same matrix, the acquired and acquirer experience also correlated at an unacceptable level. Removing the acquired variable did not affect the acquisition experience result.

Table 9 Heart Failure Quality Measure—Deal Type Variable Excluded
Patients given discharge instructions

Linear Regression		
Number of obs	=	32,843
F(23, 4322)	=	309.17
Prob > F	=	0.000
R-squared	=	0.2984
Root MSE	=	21.241

(Std. Err. Adjusted for 4,323 clusters in bhid)

hf_1	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
acquired	-1.32	5.73	-0.23	0.818	-12.55	9.91
acqexp	6.74	1.89	3.57	**0.000**	3.04	10.45
acquirertype	2.56	1.32	1.93	0.053	-0.04	5.15
_IacqXpoppc_1	-0.02	0.06	-0.37	0.711	-0.13	0.09
locacq	-1.16	1.59	-0.73	0.468	-4.28	1.96
yr_2006	-27.60	0.52	-52.74	**0.000**	-28.63	-26.57
yr_2007	-16.88	0.43	-39.39	**0.000**	-17.72	-16.04
yr_2008	-11.66	0.39	-29.82	**0.000**	-12.43	-10.90
yr_2009	-5.36	0.33	-16.19	**0.000**	-6.01	-4.71
yr_2011	2.43	0.25	9.66	**0.000**	1.94	2.92
yr_2012	6.48	0.32	20.47	**0.000**	5.86	7.11
yr_2013	8.55	0.34	25.21	**0.000**	7.88	9.21
yr_2014	4.35	0.45	9.61	**0.000**	3.46	5.23
lg10beds	14.55	0.90	16.24	**0.000**	12.79	16.31
Gme	-2.71	0.48	-5.62	**0.000**	-3.65	-1.76
Acute	0.61	1.03	0.60	0.550	-1.40	2.63
Govfed	-5.94	2.08	-2.86	**0.004**	-10.02	-1.87
Govlocal	-1.75	0.99	-1.77	0.076	-3.69	0.19
govstate	-6.68	2.18	-3.06	**0.002**	-10.95	-2.40
proprietary	1.73	0.69	2.49	**0.013**	0.37	3.09
volnpchurch	4.83	0.67	7.25	**0.000**	3.52	6.14
volnpprivate	2.32	0.56	4.17	**0.000**	1.23	3.41
poppct_urban	0.01	0.01	1.10	0.272	-0.01	0.04
_cons	49.40	1.47	33.63	0.000	46.52	52.28

As Table 10 below shows, removing both the deal and acquirer type variables did not eliminate the statistical significance associated with the heart failure metric when it came to acquirer experience.

Table 10 Heart Failure Variable without Type of Deal and Acquirer Type
Patient given discharge instructions

Linear Regression	
Number of obs =	32,843
F(22, 4322) =	323.23
Prob > F =	0.000
R-squared =	0.2983
Root MSE =	21.241

(Std. Err. adjusted for 4,323 clusters in bhid)

hf_1	**Coef.**	**Robust Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
acquired	-0.16	5.59	-0.03	0.977	-11.13	10.80
acqexp	6.12	1.87	3.28	**0.001**	2.46	9.79
_IacqXpoppc_1	-0.01	0.06	-0.24	0.809	-0.13	0.10
locacq	-0.91	1.57	-0.58	0.559	-3.98	2.16
yr_2006	-27.60	0.52	-52.75	**0.000**	-28.63	-26.58
yr_2007	-16.86	0.43	-39.35	**0.000**	-17.70	-16.02
yr_2008	-11.68	0.39	-29.86	**0.000**	-12.44	-10.91
yr_2009	-5.37	0.33	-16.22	**0.000**	-6.02	-4.72
yr_2011	2.43	0.25	9.67	**0.000**	1.94	2.92
yr_2012	6.49	0.32	20.49	**0.000**	5.87	7.11
yr_2013	8.54	0.34	25.19	**0.000**	7.88	9.21
yr_2014	4.34	0.45	9.6	**0.000**	3.45	5.22
lg10beds	14.54	0.90	16.23	**0.000**	12.79	16.30
gme	-2.70	0.48	-5.61	**0.000**	-3.64	-1.76
acute	0.62	1.03	0.6	0.548	-1.40	2.63
govfed	-5.94	2.08	-2.86	**0.004**	-10.01	-1.87
govlocal	-1.75	0.99	-1.77	0.076	-3.69	0.19
govstate	-6.68	2.18	-3.06	**0.002**	-10.95	-2.40
proprietary	1.72	0.69	2.47	**0.014**	0.35	3.08
volnpchurch	4.83	0.67	7.25	**0.000**	3.52	6.14
volnpprivate	2.32	0.56	4.17	**0.000**	1.23	3.42
poppct_urban	0.01	0.01	1.11	0.269	-0.01	0.04
_cons	49.40	1.47	33.64	0.000	46.52	52.28

III.3.3 *Pneumonia measure results.*

Table 11 shows regression results, which include robust standard errors, for the pneumonia TEC measure. The number of pneumonia measure score observations was 33,343. The linear model statistically significantly predicted the pneumonia measure $F(23, 4451) = 369.67$, $p < .0001$, adj. $R^2 = 0.2103$. The independent variables of interest and the control variables contributed to the model as follows.

Table 11 Linear Regression – Pneumonia Metric
Patients given the most appropriate initial antibiotic(s)

Linear Regression		
Number of obs	=	33,343
F(23, 4451)	=	369.67
Prob > F	=	0.000
R-squared	=	0.2109
Adj R-squared	=	0.2103
Root MSE	=	10.323

(Std. Err. adjusted for 4,452 clusters in bhid)

pn_6	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
acquired	2.343025	1.528689	1.53	0.125	-0.6539666	5.340016
acqexp	-0.4309394	0.5944132	-0.72	0.469	-1.596285	0.734406
typeofdeal	1.444043	0.5870582	2.46	**0.014**	0.2931173	2.594969
acquirertype	-0.1082617	0.5349054	-0.2	0.840	-1.156942	0.9404187
_IacqXpoppc_1	-0.0228923	0.0157844	-1.45	0.147	-0.0538375	0.008053
yr_2006	-10.74737	0.2460084	-43.69	**0.000**	-11.22966	-10.26507
yr_2007	-8.056926	0.2412555	-33.4	**0.000**	-8.529906	-7.583945
yr_2008	-2.752042	0.211239	-13.03	**0.000**	-3.166175	-2.337908
yr_2009	-2.470575	0.2512603	-9.83	**0.000**	-2.96317	-1.97798
yr_2011	0.9797937	0.1576626	6.21	**0.000**	0.6706966	1.288891
yr_2012	3.235939	0.1752545	18.46	**0.000**	2.892353	3.579525
yr_2013	3.534861	0.1857065	19.03	**0.000**	3.170784	3.898938
yr_2014	4.987877	0.1708667	29.19	**0.000**	4.652893	5.32286
lg10beds	2.129235	0.3079039	6.92	**0.000**	1.52559	2.732879
gme	-0.8354693	0.1838526	-4.54	**0.000**	-1.195912	-0.4750268
acute	-0.0626553	0.3552465	-0.18	0.860	-0.7591149	0.6338044
govfed	-0.7706866	0.6090393	-1.27	0.206	-1.964706	0.4233333
govlocal	-0.5702633	0.376496	-1.51	0.130	-1.308383	0.167856
govstate	-1.717775	0.5663929	-3.03	**0.002**	-2.828187	-0.6073634
proprietary	0.4961415	0.2643138	1.88	0.061	-0.0220448	1.014328
volnpchurch	1.442783	0.2387014	6.04	**0.000**	0.9748095	1.910756
volnpprivate	0.9247121	0.2097734	4.41	**0.000**	0.5134519	1.335972
poppct_urban	0.0306212	0.0047168	6.49	**0.000**	0.0213739	0.0398685
cons	83.21924	0.5497255	151.38	0.000	82.14151	84.29698

The deal type variable showed a statistically significant difference, p = .014, which suggests that transactions that involve multiple hospitals are associated with an increase in pneumonia measure scores. As with the previous two measures, the statistically significant negative association of state government ownership appears to persist here. Similar to the heart failure measure, voluntary nonprofit church and voluntary nonprofit private ownerships exhibit statistically significant positive

associations. Unlike the heart failure measure, and like the heart attack measure, no significant difference appears when hospitals are owned by federal government entities. In a departure from the heart attack and heart failure results, urbanization (poppct_urban) appears to have a statistically significant positive association here at the $p < .001$ level.

III.3.4 *Surgical infection prevention measure results.*

Table 12 shows regression results for the surgical infection measure. The number of surgical infection prevention measure score observations was 26,113. The linear model statistically significantly predicted the surgical infection prevention measure $F(22, 4254) = 314.46$, $p < .0001$, adj. $R^2 = 0.1987$. The independent variables of interest and the control variables contributed to the model as follows.

In contrast with other TEC measures—where no statistical significance was seen—acquisition exhibited a statistically significant ($p = .035$) negative association with the surgical infection measure. Acquirer type, on the other hand, appears to be associated with a statistically significant positive influence at the $p = .045$ level. As with the heart attack measure, for the surgical infection prevention measure, acute status shows a statistically significant difference at the $p < .001$ level; here, however, acute status takes an opposite (negative) direction. Ownership by the federal government appears to result in a statistically significant ($p= .001$) negative association with scores as it did with the heart failure measure. State government ownership no longer displays a statistically significant difference as it did with all of the other TEC measures. Voluntary nonprofit church and voluntary nonprofit private ownership show statistical significance at the $p = .004$ level for both.

Table 12 Linear Regression—Surgical Infection Prevention Metric
Antibiotics given 1 hour before surgical incision

Linear Regression	
Number of obs =	26,113
F(22, 4254) =	314.46
Prob > F =	0.000
R-squared =	0.1994
Adj R-squared =	0.1987
Root MSE =	17.934

(Std. Err. adjusted for 4,255 clusters in bhid)

scip_inf_1	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
acquired	-9.580302	4.534921	-2.11	**0.035**	-18.47111	-0.6894911
acqexp	2.240669	1.17916	1.9	0.057	-0.0710993	4.552437
typeofdeal	0.2956308	1.037629	0.28	0.776	-1.738664	2.329925
acquirertype	2.11415	1.052553	2.010	**0.045**	0.0505967	4.177703
_IacqXpoppc_1	0.0849851	0.0505017	1.680	0.092	-0.0140247	0.1839948
yr_2006	-17.86073	0.4375643	-40.820	**0.000**	-18.71858	-17.00287
yr_2007	-12.88735	0.3230468	-39.890	**0.000**	-13.52069	-12.25401
yr_2008	-8.899963	0.2944722	-30.220	**0.000**	-9.477282	-8.322644
yr_2009	-17.3041	0.5929411	-29.180	**0.000**	-18.46658	-16.14163
yr_2011	1.196452	0.1817135	6.580	**0.000**	0.8401991	1.552705
yr_2012	3.182899	0.2001037	15.910	**0.000**	2.790592	3.575207
yr_2013	3.673741	0.1997581	18.390	**0.000**	3.282111	4.065371
yr_2014	0	(omitted)*				
lg10beds	4.48712	0.4587359	9.780	**0.000**	3.587758	5.386481
gme	0.3553823	0.3278293	1.08	0.278	-0.2873342	0.9980987
acute	-2.080949	0.5972306	-3.48	**0.000**	-3.251833	-0.9100657
govfed	-3.108888	0.9608239	-3.24	**0.001**	-4.992605	-1.225172
govlocal	0.2768383	0.5844783	0.47	0.636	-0.8690441	1.422721
govstate	-1.534209	1.12001	-1.37	0.171	-3.730014	0.6615961
proprietary	-0.7640291	0.4470341	-1.71	0.088	-1.640449	0.1123909
volnpchurch	1.27366	0.4382464	2.91	**0.004**	0.4144683	2.132851
volnpprivate	1.031344	0.3541928	2.910	**0.004**	0.3369409	1.725746
poppct_urban	0.0143724	0.0077061	1.87	0.062	-0.0007357	0.0294804
cons	84.63078	0.9004386	93.99	0.000	82.86545	86.39611

* For this measure only, observations for the year 2014 were omitted due to collinearity.

When I omitted the deal and acquirer type variables from the regression (see Table 13 below), based on the unacceptable level of correlation previously discussed (section III.3.2), the statistically significant negative association of acquisition status with the surgical infection measure was still evident at the p = .037 level.

Table 13 Surgical Infection Prevention Measure Without Deal and Acquirer Type
Antibiotics given 1 hour before surgical incision

Linear Regression		
Number of obs	=	26,450
F(21, 4254)	=	326.95
Prob > F	=	0.000
R-squared	=	0.2

(Std. Err. Adjusted for 4,255 clusters in bhid)

scip_inf_1	**Coef.**	**Robust Std. Err.**	**T**	**P>|t|**	**[95% Conf.**	**Interval]**
acquired	-8.94	4.30	-2.08	**0.037**	-17.37	-0.52
acqexp	1.80	1.22	1.47	0.141	-0.60	4.20
_IacqXpoppc_1	0.09	0.05	1.93	0.054	0.00	0.19
locacq	1.26	0.78	1.61	0.107	-0.27	2.80
yr_2006	-18.02	0.45	-40.32	**0.000**	-18.89	-17.14
yr_2007	-12.87	0.32	-40.00	**0.000**	-13.50	-12.24
yr_2008	-8.97	0.30	-30.00	**0.000**	-9.56	-8.39
yr_2009	-17.33	0.60	-29.11	**0.000**	-18.49	-16.16
yr_2011	1.19	0.18	6.57	**0.000**	0.83	1.54
yr_2012	3.16	0.20	15.94	**0.000**	2.77	3.55
yr_2013	3.65	0.20	18.31	**0.000**	3.26	4.04
yr_2014	0.00	(omitted due to collinearity)				
lg10beds	4.37	0.46	9.59	**0.000**	3.48	5.27
gme	0.35	0.33	1.07	0.285	-0.29	1.00
acute	-1.98	0.60	-3.32	**0.001**	-3.15	-0.81
govfed	-3.10	0.96	-3.22	**0.001**	-4.98	-1.21
govlocal	0.20	0.59	0.34	0.731	-0.95	1.35
govstate	-1.54	1.12	-1.38	0.168	-3.73	0.65
proprietary	-0.80	0.45	-1.80	0.073	-1.68	0.07
volnpchurch	1.24	0.44	2.83	**0.005**	0.38	2.10
volnpprivate	0.99	0.35	2.80	**0.005**	0.30	1.68
poppct_urban	0.02	0.01	2.00	**0.046**	0.00	0.03
_cons	84.76	0.90	94.60	0.000	83.01	86.52

Again, as discussed in section III.3.2, in the same matrix, the acquired and the acquirer experience variables correlated at an unacceptable level. When the acquirer experience variable was removed along with the deal and acquirer type variables, the

result was no longer statistically significant, which suggests some interaction. This regression is shown in Table 14 below.

Table 14 Surgical Infection Prevention Measure Without Acquirer Experience and Deal and Acquirer Type
Antibiotics given 1 hour before surgical incision

Linear Regression		
Number of obs	=	26,450
F(20, 4254)	=	343.16
Prob > F	=	0.000
R-squared	=	0.1999
Root MSE	=	17.933

(Std. Err. adjusted for 4,255 clusters in bhid)

scip_inf_1	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
acquired	-7.41	4.04	-1.83	0.067	-15.33	0.51
_IacqXpoppc_1	0.09	0.05	1.83	0.068	-0.01	0.18
locacq	1.07	0.79	1.35	0.178	-0.49	2.62
yr_2006	-18.02	0.45	-40.35	**0.000**	-18.90	-17.15
yr_2007	-12.86	0.32	-39.96	**0.000**	-13.49	-12.23
yr_2008	-8.97	0.30	-29.98	**0.000**	-9.56	-8.38
yr_2009	-17.32	0.60	-29.09	**0.000**	-18.49	-16.15
yr_2011	1.19	0.18	6.56	**0.000**	0.83	1.54
yr_2012	3.16	0.20	15.94	**0.000**	2.77	3.55
yr_2013	3.59	0.19	18.74	**0.000**	3.21	3.96
yr_2014	0.00	(omitted due to collinearity)				
lg10beds	4.38	0.46	9.60	**0.000**	3.49	5.27
gme	0.34	0.33	1.04	0.300	-0.30	0.99
acute	-1.97	0.60	-3.31	**0.001**	-3.14	-0.80
govfed	-3.10	0.96	-3.22	**0.001**	-4.98	-1.21
govlocal	0.20	0.59	0.35	0.730	-0.95	1.35
govstate	-1.54	1.12	-1.38	0.169	-3.73	0.65
proprietary	-0.79	0.45	-1.76	0.079	-1.67	0.09
volnpchurch	1.23	0.44	2.82	**0.005**	0.38	2.09
volnpprivate	0.99	0.35	2.81	**0.005**	0.30	1.69
poppct_urban	0.02	0.01	2.00	**0.045**	0.00	0.03
_cons	84.75	0.90	94.52	0.000	82.99	86.51

III.3.5 *Operating cost-to-charge ratio measure results.*

The number of operating cost-to-charge ratio observations was 28,183 (see Table 15).

For this measure, I omitted observations for the acute indicator due to collinearity. The linear model statistically predicted a significant difference in operating cost-to-

charges, F(22, 3330) = 136.60, p < .0001, adj. R^2 = 0.2949. The independent variables of interest and the control variables contributed to the model as follows.

Table 15 Linear Regression—Operating Cost-to-Charge Ratio Metric
Hospital operating costs divided by the sum of in and outpatient charges

Linear Regression		
Number of obs	=	28,183
F(22, 3330)	=	136.6
Prob > F	=	0.000
R-squared	=	0.2955
Adj R-squared	=	0.2949
Root MSE	=	0.12576

(Std. Err. adjusted for 3,331 clusters in bhid)

opccr	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
acquired	-0.0850736	0.0298857	-2.85	**0.004**	-0.1436699	-0.0264774
acqexp	-0.0400228	0.0152475	-2.62	**0.009**	-0.0699182	-0.0101274
typeofdeal	-0.0015831	0.017075	-0.09	0.926	-0.0350617	0.0318955
acquirertype	0.0030921	0.0126339	0.240	0.807	-0.0216789	0.027863
_IacqXpoppc_1	0.0011743	0.000387	3.030	**0.002**	0.0004155	0.0019331
yr_2006	0.033588	0.0019563	17.170	**0.000**	0.0297524	0.0374236
yr_2007	0.0236001	0.0018617	12.68	**0.000**	0.0199499	0.0272503
yr_2008	0.0129841	0.0016203	8.01	**0.000**	0.0098072	0.0161609
yr_2009	0.0045208	0.0013624	3.320	**0.001**	0.0018496	0.007192
yr_2011	-0.0040741	0.0014164	-2.880	**0.004**	-0.0068512	-0.0012969
yr_2012	-0.0209336	0.0014623	-14.320	**0.000**	-0.0238006	-0.0180665
yr_2013	-0.0293004	0.0016601	-17.650	**0.000**	-0.0325554	-0.0260454
yr_2014	-0.0341596	0.0017406	-19.630	**0.000**	-0.0375723	-0.0307469
lg10beds	-0.1203741	0.0058785	-20.48	**0.000**	-0.1318999	-0.1088484
gme	0.0204394	0.0043348	4.72	**0.000**	0.0119403	0.0289386
acute	0	(omitted)				
govfed	-0.0428425	0.0130269	-3.290	**0.001**	-0.0683841	-0.0173009
govlocal	0.0496296	0.0085636	5.800	**0.000**	0.0328392	0.0664201
govstate	0.0826154	0.0168629	4.900	**0.000**	0.0495528	0.1156781
proprietary	-0.1057231	0.0051711	-20.45	**0.000**	-0.1158619	-0.0955842
volnpchurch	-0.026208	0.0061093	-4.290	**0.000**	-0.0381864	-0.0142296
volnpprivate	0.0087718	0.004854	1.810	0.071	-0.0007454	0.018289
poppct_urban	-0.001044	0.0000915	-11.41	**0.000**	-0.0012234	-0.0008645
cons	0.7151059	0.0126593	56.49	0.000	0.6902851	0.7399266

Acquisition and acquirer experience appear to be associated with lower operating cost-to-charge ratios in a statistically significant way at the p = .004 and p = .009 levels, respectively, while the deal and acquirer types show no statistical significance.

The interaction term indicating the acquisition's urbanicity is associated with a positive cost-to-charges ratio ($p = .002$). Local government or state government ownership appears to be associated with a higher ratio in a statistically significant way at the $p < .001$ level, as does teaching status ($p < .001$). Federal government ($p = .001$), proprietary ($p < .001$), and voluntary nonprofit church ($p < .001$) ownerships and urbanization ($p < .001$) each have a statistically significant association with a lower operating cost-to-charges ratio.

III.3.6 *Capital cost-to-charge ratio measure results.*

As Table 16 shows, the number of capital cost-to-charge ratio observations was 28,177. The linear model statistically significantly predicted the cost-to-charge ratio $F(22, 3330) = 46.99$, $p < .0001$, adj. $R^2 = 0.1429$. The independent variables of interest and the control variables contributed to the model as follows.

Acquisition showed no significance, but acquirer experience appears to be associated with a statistically significant decline in the capital cost-to-charge ratio ($p = .001$). The type of deal or acquirer and the acquisition/urbanization interaction term did not return statistically significant results.

Year-over-year showed a statistically significant decrease in the capital cost-to-charge ratio with the exception of 2009 and 2011. As with operating cost-to-charge ratio results, bed size showed a statistically significant lowering of the capital cost-to-charge ratio at the $p < .001$ level. Federal government ($p < .001$), proprietary ($p < .001$), and voluntary nonprofit church ($p < .001$) ownerships were associated with a statistically significant lowering of the capital cost-to-charge ratio. Urbanization also resulted in a

decrease in the ratio at a statistical significance level of p = .006, while local government ownership was related to an increase in the ratio at a significance level of p = .001.

Table 16 Linear Regression—Capital Cost-to-Charge Ratio Metric
Hospital capital expenditures divided by the sum of in- and outpatient charges

Linear Regression		
Number of obs	=	28,177
F(22, 3330)	=	46.99
Prob > F	=	0.000
R-squared	=	0.1436
Adj R-squared	=	0.1429
Root MSE	=	0.01656

(Std. Err. adjusted for 3,331 clusters in bhid)

cpccr	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
acquired	-0.002328	0.0035374	-0.66	0.511	-0.0092636	0.0046077
acqexp	-0.005473	0.0016808	-3.26	**0.001**	-0.0087684	-0.0021775
typeofdeal	0.0008998	0.0017319	0.52	0.603	-0.0024959	0.0042956
acquirertype	-0.0000566	0.0016337	-0.030	0.972	-0.0032597	0.0031465
_IacqXpoppc_1	0.000045	0.0000443	1.020	0.310	-0.0000418	0.0001318
yr_2006	0.0032509	0.000332	9.79	**0.000**	0.0026	0.0039018
yr_2007	0.001482	0.0002935	5.05	**0.000**	0.0009066	0.0020574
yr_2008	0.0005824	0.0002548	2.29	**0.022**	0.0000828	0.001082
yr_2009	-0.0002996	0.0002099	-1.43	0.153	-0.0007111	0.0001118
yr_2011	0.0001719	0.0002256	0.76	0.446	-0.0002704	0.0006143
yr_2012	-0.0005404	0.0002468	-2.19	**0.029**	-0.0010243	-0.0000564
yr_2013	-0.0006828	0.0002916	-2.340	**0.019**	-0.0012546	-0.000111
yr_2014	-0.0009886	0.000323	-3.06	**0.002**	-0.0016218	-0.0003554
lg10beds	-0.0142996	0.00079	-18.1	**0.000**	-0.0158485	-0.0127507
gme	0.0001808	0.0004636	0.390	0.697	-0.0007281	0.0010897
acute	0	(omitted)				
govfed	-0.0059867	0.0012807	-4.67	**0.000**	-0.0084978	-0.0034756
govlocal	0.0037835	0.0011189	3.380	**0.001**	0.0015896	0.0059774
govstate	-0.0000934	0.0013728	-0.070	0.946	-0.0027850	0.0025983
proprietary	-0.0040045	0.0006808	-5.88	**0.000**	-0.0053393	-0.0026697
volnpchurch	-0.0025419	0.0006603	-3.85	**0.000**	-0.0038366	-0.0012472
volnpprivate	0.0008459	0.0005522	1.530	0.126	-0.0002369	0.0019286
poppct_urban	-0.0000308	0.0000112	-2.75	**0.006**	-0.0000527	-0.0000089
cons	0.0645783	0.0016738	38.58	0.000	0.0612966	0.0678601

III.4 Consolidated linear regression results—quality and efficiency.

Table 17 below provides the coefficients and p values for the dependent variables in a consolidated format, with an additional control variable that serves as a proxy for local acquisition, as I discuss later in section III.5.2.

Table 17 Consolidated Results Table

Dependent, independent and control variable consolidated results

	Measures of Quality								**Measures of Efficiency**			
	ami8a		**hf_1**		**pn_6**		**scip_inf_1**		**opccr**		**Cpccr**	
Variable	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|
acquired	-16.24	0.197	-1.60	0.783	2.30	0.128	-9.79	**0.023**	-0.08	**0.007**	0.00	0.902
acqexp	-5.18	0.089	6.50	**0.000**	-0.31	0.609	2.17	0.056	-0.05	**0.002**	-0.01	**0.001**
typeofdeal	6.51	**0.026**	0.94	0.513	1.46	**0.014**	0.42	0.684	0.00	0.871	0.00	0.449
acquirertype	2.27	0.494	2.47	0.062	-0.08	0.881	1.86	0.075	0.00	0.770	0.00	0.927
locacq	-5.94	**0.018**	-1.16	0.467	0.35	0.460	1.07	0.174	0.00	0.945	0.00	0.859
yr_2006	-20.54	**0.000**	-27.60	**0.000**	-10.75	**0.000**	-18.01	**0.000**	0.03	**0.000**	0.00	**0.000**
yr_2007	-27.74	**0.000**	-16.87	**0.000**	-8.06	**0.000**	-12.88	**0.000**	0.02	**0.000**	0.00	**0.000**
yr_2008	-18.42	**0.000**	-11.66	**0.000**	-2.79	**0.000**	-8.96	**0.000**	0.01	**0.000**	0.00	**0.025**
yr_2009	-8.32	**0.000**	-5.36	**0.000**	-2.45	**0.000**	-17.32	**0.000**	0.01	**0.000**	0.00	0.212
yr_2011	2.32	**0.000**	2.43	**0.000**	1.00	**0.000**	1.19	**0.000**	0.00	**0.010**	0.00	0.453
yr_2012	7.28	**0.000**	6.49	**0.000**	3.24	**0.000**	3.16	**0.000**	-0.02	**0.000**	0.00	0.096
yr_2013	8.65	**0.000**	8.55	**0.000**	3.57	**0.000**	3.65	**0.000**	-0.03	**0.000**	0.00	**0.026**
yr_2014	9.80	**0.000**	4.35	**0.000**	5.00	**0.000**	**	**	-0.03	**0.000**	0.00	**0.003**
lg10beds	2.55	**0.019**	14.55	**0.000**	2.19	**0.000**	4.38	**0.000**	-0.12	**0.000**	-0.01	**0.000**
gme	-0.83	0.142	-2.71	**0.000**	-0.83	**0.000**	0.34	0.294	0.02	**0.000**	0.00	0.779
acute	26.92	**0.000**	0.62	0.549	-0.08	0.817	-1.98	**0.001**	0.00	*	0.00	*
govfed	-3.65	0.308	-5.94	**0.004**	-0.78	0.198	-3.10	**0.001**	-0.04	**0.001**	-0.01	**0.000**
govlocal	-2.92	0.117	-1.76	0.076	-0.54	0.148	0.20	0.733	0.05	**0.000**	0.00	**0.001**
govstate	-7.33	**0.001**	-6.68	**0.002**	-1.71	**0.003**	-1.54	0.168	0.08	**0.000**	0.00	0.958
proprietary	-0.33	0.712	1.72	0.013	0.45	0.096	-0.80	0.075	-0.10	**0.000**	0.00	**0.000**
volnpchurch	0.88	0.306	4.83	**0.000**	1.43	**0.000**	1.23	**0.005**	-0.03	**0.000**	0.00	**0.000**
volnpprivate	0.84	0.228	2.32	**0.000**	0.91	**0.000**	0.99	**0.005**	0.01	0.069	0.00	0.129
poppct_urban	0.03	0.088	0.01	0.273	0.03	**0.000**	0.02	**0.047**	0.00	**0.000**	0.00	**0.007**
IacqXpoppc_1	0.13	0.337	-0.02	0.703	-0.02	0.116	0.09	0.075	0.00	**0.002**	0.00	0.718
constant	50.03	0.000	49.40	0.000	83.17	0.000	84.76	0.000	0.71	0.000	0.06	0.000
Number of observations	12,560		33,343		26,113		26,113		28,183		28,177	
Adjusted R-squared	0.3917		0.2109		0.1994		0.1987		0.2955		0.1429	

* Omitted due to collinearity

** Not reported in 2014

III.4.1 *Quality measures.*

Across the independent variables of interest that reflect measures of quality (TEC), I found no statistically significant differences between hospitals that had been acquired versus those that had not; the only exception was with the surgical infection prevention measure. In that case, acquisition appeared to be associated with a statistically

significant negative effect (lower compliance with surgical infection protocols or lower quality) on scores at the p = .04 level. When comparing hospitals whose acquirers had experience to hospitals whose acquirers had no prior experience (as defined in this study), I found no significant differences in any of the TEC measures studied. Hospitals acquired as part of a multi-hospital deal had a statistically significant greater compliance with the heart attack standard of care (p = .05) and with the pneumonia quality compliance (p=.01), although this result did not remain consistent across other quality or efficiency measures. Being acquired by a health system was associated with higher compliance with the surgical infection prevention measure (p = .05).

The size of the hospital, in terms of the number of beds represented by the log10beds variable, appears to matter for all TEC measures; all show a statistically significant positive difference, with significance levels of p = .009 (heart attack), p = .001 (heart failure), p = .001 (pneumonia), and p = .001 (surgical infection prevention).

III.4.2 *Efficiency Measures.*

In general, the efficiency measures—the operating cost-to-charge and capital cost-to-charge ratios—had a somewhat different pattern. Acquisition was associated with a lower operating cost-to-charge ratio at a significance level of p = .004, while acquirer experience was associated with lower operating and capital cost-to-charge ratios at significance levels of p = .009 and .001, respectively. Neither deal type nor acquirer type had a statistically significant effect on the operating or capital cost-to-charge ratio. Additional details on control variables can be found in sections IV, Table 27, and the following section (III.5).

III.5 Other Specifications—Fixed-Effects Multivariate Linear Regressions

To further explore results related to the operating cost-to-charge ratio and capital cost-to-charge ratio observations, I created two correlation matrices (see Appendix B) and ran additional specifications to evaluate year-over-year percent changes in Medicare reported hospital costs (chgincost) and inpatient (chgininpatient) and outpatient (chginoutpatient) charges by facility. In addition, acquisitions involving acquirers and the acquired who belonged to the same Core Base Statistical Area (CBSA), as defined by CMS, were distinguished from those that did not as a proxy for local acquisition proximity (locacq) in order to access market variability. Table 18 below provides a description of the additional variables analyzed.

Table 18 Description of Variables—Other Specifications
Additional variables analyzed

Variable Name	Variable Description	Nature of Data
chgincosts	Percent change in hospital costs reported to CMS year-over-year by facility	Percent change
chgininpatient	Percent change in hospital inpatient charges reported to CMS year-over-year by facility	Percent change
chginoutpatient	Percent change in hospital outpatient charges reported to CMS year-over-year by facility	Percent change
locacq	Acquirer and acquired are from same CSBA	Dummy variable

III.5.1 *Percent change in hospital costs and inpatient and outpatient charges.*

Note that the variables cited in this section exhibited unacceptably high correlation values both with and without the deal and acquirer type variables (see Table 28 and Table 29, respectively; for the correlation matrices, see Appendix B). However, this does not affect the analyses in Table 19–Table 21 below, as the individual models do not include the variables together in one model.

Table 19 shows the percent change in hospital costs linear regression, with 31,481 observations. The linear model statistically significantly predicted the percent change in hospital costs $F(21, 4177) = 11.25$, $p < .0001$, $R^2 = 0.0013$. Given the R^2, this model would be a very weak predictor of change in hospital costs.

The independent variables of interest and acquired and acquirer experiences showed no statistically significant association with the percent change in hospital costs year-over-year.

Table 19 Percent Change in Costs Year-over-Year by Facility

Percent change in hospital costs 2005–2014

Linear Regression		
Number of obs	=	31,481
F(21, 4177)	=	11.25
Prob > F	=	0.000
R-squared	=	0.0013
Root MSE	=	4.7524

(Std. Err. Adjusted for 4,178 clusters in bhid)

Chgincost	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Acquired	0.32	0.39	0.82	0.414	-0.45	1.09
Acqexp	-0.02	0.07	-0.27	0.789	-0.16	0.12
_IacqXpoppc_1	0.00	0.00	-0.43	0.665	-0.01	0.01
yr_2006	0.12	0.05	2.75	**0.006**	0.04	0.21
yr_2007	0.12	0.04	3.05	**0.002**	0.04	0.19
yr_2008	0.28	0.20	1.44	0.151	-0.10	0.67
yr_2009	0.15	0.10	1.49	0.137	-0.05	0.34
yr_2011	0.05	0.04	1.33	0.184	-0.02	0.13
yr_2012	-0.02	0.02	-1.30	0.194	-0.06	0.01
yr_2013	0.01	0.02	0.31	0.758	-0.03	0.05
yr_2014	0.00	0.02	0.02	0.985	-0.05	0.05
lg10beds	0.06	0.08	0.83	0.409	-0.09	0.21
gme	0.01	0.01	0.52	0.604	-0.02	0.03
acute	-0.29	0.19	-1.54	0.124	-0.65	0.08
govfed	0.04	0.07	0.62	0.536	-0.10	0.19
govlocal	0.24	0.27	0.91	0.363	-0.28	0.77
govstate	0.03	0.04	0.65	0.519	-0.06	0.11
proprietary	0.07	0.05	1.45	0.148	-0.03	0.18
volnpchurch	0.02	0.05	0.41	0.682	-0.07	0.11
volnpprivate	0.00	0.05	-0.10	0.919	-0.10	0.09
poppct_urban	0.00	0.00	-1.38	0.166	-0.01	0.00
_cons	0.26	0.12	2.22	0.026	0.03	0.49

Table 20 contains the linear regression for percent change in hospital inpatient charges year-over-year. This model *does not* predict statistically significant changes in inpatient charges F(21, 4406) = 0.53, p = p < .962, R^2 = 0.0019.

Table 20 Percent Change in Inpatient Charges Year-over-Year by Facility
Percent change in hospital inpatient charges 2005–2014

Linear Regression		
Number of obs	=	35,703
F(21, 4406)	=	0.53
Prob > F	=	0.962
R-squared	=	0.0019
Root MSE	=	1137.5

(Std. Err. Adjusted for 4,407 clusters in bhid)

chgininpatient	Coef.	Robust Std. Err.	T	P>|t|	[95% Conf.	Interval]
acquired	-53.84	29.79	-1.81	0.071	-112.24	4.57
acqexp	39.64	24.65	1.61	0.108	-8.68	87.96
_IacqXpoppc_1	0.22	0.15	1.43	0.152	-0.08	0.51
yr_2006	1.17	1.09	1.08	0.282	-0.96	3.30
yr_2007	0.30	0.74	0.40	0.690	-1.16	1.75
yr_2008	0.28	0.70	0.40	0.687	-1.08	1.64
yr_2009	0.05	0.68	0.07	0.947	-1.29	1.38
yr_2011	-1.57	1.26	-1.24	0.214	-4.04	0.90
yr_2012	3.16	1.96	1.61	0.107	-0.69	7.01
yr_2013	82.52	52.64	1.57	0.117	-20.68	185.71
yr_2014	-0.87	2.73	-0.32	0.749	-6.22	4.47
lg10beds	-5.26	4.77	-1.10	0.270	-14.62	4.09
gme	-11.19	11.03	-1.01	0.310	-32.81	10.43
acute	30.75	16.04	1.92	0.055	-0.69	62.19
govfed	371.94	186.88	1.99	**0.047**	5.56	738.32
govlocal	-20.89	19.38	-1.08	0.281	-58.89	17.11
govstate	-17.92	20.84	-0.86	0.390	-58.77	22.93
proprietary	-24.64	25.10	-0.98	0.326	-73.84	24.57
volnpchurch	-18.46	21.15	-0.87	0.383	-59.94	23.01
volnpprivate	-21.73	22.18	-0.98	0.327	-65.22	21.76
poppct_urban	-0.22	0.17	-1.26	0.206	-0.55	0.12
_cons	15.26	11.14	1.37	0.171	-6.58	37.10

The model in Table 21 is also a very weak predictor based on the R2, although it does predict a statistically significant change in outpatient charges year-over-year F(21,4401), p < .001, R2 = .0145.

Table 21 Percent Change in Outpatient Charges Year-over-Year by Facility

Percent change in hospital outpatient charges 2005–2014

Linear Regression		
Number of obs	=	35,655
F(21, 4401)	=	5.38
Prob > F	=	0.000
R-squared	=	0.0145
Root MSE	=	4.1484

(Std. Err. Adjusted for 4,402 clusters in bhid)

chginoutpatient	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
acquired	-0.21	0.17	-1.23	0.218	-0.55	0.12
acqexp	0.18	0.11	1.64	0.100	-0.03	0.38
_IacqXpoppc_1	0.00	0.00	1.26	0.209	0.00	0.00
yr_2006	0.10	0.02	6.39	**0.000**	0.07	0.13
yr_2007	0.07	0.02	3.26	**0.001**	0.03	0.11
yr_2008	0.05	0.02	2.81	**0.005**	0.02	0.09
yr_2009	0.03	0.01	2.71	**0.007**	0.01	0.05
yr_2011	0.01	0.01	1.11	0.269	-0.01	0.04
yr_2012	0.00	0.01	0.26	0.794	-0.02	0.02
yr_2013	0.37	0.18	2.08	**0.038**	0.02	0.72
yr_2014	-0.04	0.03	-1.39	0.163	-0.09	0.02
lg10beds	-0.25	0.09	-2.78	**0.005**	-0.43	-0.07
gme	0.06	0.03	1.97	**0.049**	0.00	0.12
acute	0.31	0.13	2.49	**0.013**	0.07	0.56
govfed	4.81	2.22	2.16	**0.031**	0.45	9.16
govlocal	-0.02	0.01	-1.55	0.121	-0.04	0.00
govstate	0.16	0.11	1.38	0.168	-0.07	0.38
proprietary	0.04	0.02	2.12	**0.034**	0.00	0.07
volnpchurch	0.03	0.02	1.39	0.165	-0.01	0.07
volnpprivate	0.02	0.01	2.14	**0.032**	0.00	0.04
poppct_urban	0.00	0.00	-1.35	0.177	0.00	0.00
_cons	0.39	0.11	3.59	0.000	0.18	0.60

Table 19–Table 21 are consolidated in Table 22 below. As the table shows, there were very few statistically significant differences associated with the variables in the percent change-in-cost and inpatient charges.

Table 22 Year-over-Year Changes in Cost and Charges by Facility
Consolidated hospital costs and inpatient and outpatient charges

	chgincost		**chgininpatient**		**chginoutpatient**	
Variable	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|
acquired	0.19	0.535	-54.25	0.071	-0.24	0.174
acqexp	0.04	0.680	39.84	0.113	0.19	0.075
typeofdeal	0.04	0.567	1.10	0.823	0.01	0.798
acquirertype	0.24	0.139	0.02	0.997	0.05	0.315
locacq	0.02	0.606	2.29	0.650	0.03	0.589
yr_2006	0.12	**0.006**	1.16	0.285	0.10	**0.000**
yr_2007	0.12	**0.002**	0.29	0.696	0.07	**0.001**
yr_2008	0.28	0.149	0.28	0.691	0.05	**0.005**
yr_2009	0.15	0.135	0.04	0.952	0.03	**0.007**
yr_2011	0.05	0.183	-1.56	0.216	0.01	0.267
yr_2012	-0.02	0.192	3.17	0.105	0.00	0.786
yr_2013	0.01	0.721	82.54	0.117	0.37	**0.038**
yr_2014	0.00	0.966	-0.88	0.746	-0.04	0.164
lg10beds	0.06	0.406	-5.27	0.269	-0.25	**0.005**
gme	0.01	0.657	-11.20	0.310	0.06	**0.050**
acute	-0.29	0.123	30.74	0.055	0.31	**0.013**
govfed	0.04	0.535	371.96	**0.047**	4.81	**0.031**
govlocal	0.24	0.363	-20.88	0.282	-0.02	0.127
govstate	0.03	0.509	-17.89	0.391	0.16	0.166
proprietary	0.08	0.142	-24.61	0.327	0.04	**0.031**
volnpchurch	0.02	0.677	-18.44	0.384	0.03	0.163
volnpprivate	-0.01	0.911	-21.73	0.327	0.02	**0.033**
poppct_urban	0.00	0.164	-0.22	0.206	0.00	0.176
_IacqXpoppc_1	0.00	0.576	0.20	0.159	0.00	0.299
_cons	0.26	0.026	15.27	0.170	0.39	0.001

The only variable that showed statistical significance in the percent change in inpatient charges was federal government ownership, at the p = .047 level, moving in a positive (i.e., increasing) direction. Overall, the percent change in outpatient charges appeared to be increasing in the early years, with statistically significant increases in 2006 (p < .001), 2007 (p = .001), 2008 (p = .005), and 2009 (p = .007), although the magnitude of increase appeared to be decreasing until 2011 and 2012. However, a statistically significant increase—at the p = .038 level—was observed again in 2013, followed by an insignificant change in 2014.

Bed size was associated with a decrease in the change in outpatient costs, as a statistically significant difference was seen at the p = .005 level. Conversely, teaching hospitals showed an increase in the percent change in outpatient charges at the p = .013 level, while acute hospitals displayed a decrease (p = .031). In terms of hospital ownership, federal government (p = .031), proprietary (p = .031), and voluntary nonprofit privately owned (p = .033) hospitals showed statistically significant increases in the percent change in outpatient charges.

III.5.2 *Local acquisition.*

Local acquisition was accessed with and without the deal and acquirer type variables. Table 23 shows the consolidated regression results for the local acquisition variable described earlier (in section III.5 and Table 18).

Acquirer experience showed a negative statistical significance (p = .007), which suggests that experienced acquirers do not tend to acquire hospitals within their own CSBA. This relationship appears to strengthen (p < .001) when the deal and the acquirer type variables are omitted.

However, acquirer type might play a role in whether or not acquisitions are carried out within the same CSBA; since a statistically significant positive association (p = .001) is observed between hospital systems, or larger organizations, and acquisitions occurring in the same CSBA.

All hospital ownership types studied—except for federal government and voluntary nonprofit private ownership—appear to be negatively associated with local acquisition: statistically significant negative differences were found for local government

Table 23 Other Specifications—Local Acquisition

Local acquisition consolidated results with and without deal and acquirer type

	Locacq		**locacq**	
Variable	Coef.	P>|t|	Coef.	P>|t|
acquired	-5.00E-02	0.572	4.32E-02	0.670
acqexp	-1.48E-01	**0.007**	-1.94E-01	**0.000**
typeofdeal	1.31E-02	0.839	**	**
acquirertype	1.92E-01	**0.001**	**	**
yr_2006	5.87E-03	**0.000**	5.58E-03	**0.000**
yr_2007	1.27E-03	0.274	2.76E-03	**0.006**
yr_2008	3.04E-03	**0.002**	2.02E-03	**0.035**
yr_2009	2.70E-03	**0.002**	2.05E-03	**0.023**
yr_2011	-1.45E-03	0.121	-1.46E-03	0.122
yr_2012	-4.22E-03	**0.000**	-4.03E-03	**0.000**
yr_2013	-1.02E-02	**0.000**	-1.08E-02	**0.000**
yr_2014	4.85E-03	**0.000**	4.49E-03	**0.000**
lg10beds	2.45E-03	0.485	2.23E-03	0.530
gme	2.94E-03	0.574	3.60E-03	0.499
acute	4.10E-03	0.154	4.31E-03	0.142
govfed	-9.16E-03	0.067	-9.23E-03	0.066
govlocal	-7.26E-03	**0.008**	-7.43E-03	**0.010**
govstate	-1.66E-02	**0.000**	-1.70E-02	**0.000**
proprietary	-1.33E-02	**0.008**	-1.44E-02	**0.005**
volnpchurch	-1.33E-02	**0.001**	-1.34E-02	**0.001**
volnpprivate	8.46E-04	0.833	1.05E-03	0.797
poppct_urban	1.33E-04	**0.003**	1.40E-04	**0.002**
_IacqXpoppc_1	3.84E-03	**0.003**	4.41E-03	**0.001**
_cons	-4.95E-03	0.381	-4.68E-03	0.415

**type of deal and acquirer type omitted

(p = .010), state government (p < .001), proprietary (p = .005), and voluntary nonprofit church (p = .001) ownership types.

When deal and acquirer types are omitted, acquirers with experience seem to be more negatively related to local acquisition (p < .001), and local acquisition appears to have been more prevalent in the early years as opposed to later years. Positive statistically significant differences were seen in 2006 (p < .001), 2007 (p = .006), 2008 (p = .035), and 2009 (p = .023), while negative statistically significant differences were seen in 2012 (p < .001) and 2013 (p < .001). However, 2014 returned to a statistically positive difference at p < .001.

Local and state government, proprietary, and voluntary nonprofit church organizations appear to be associated negatively with local acquisition at statistically significant levels of p = .01, p < .001, p = .005, and p = .001, respectively. On the other hand, urbanization displayed a statistically significant positive association (p = .002).

Full regression results for local acquisition and local acquisition without deal and acquirer types are shown in Table 24 andTable 25 below.

Table 24 Local Acquisition Analysis

Full regression results for local acquisition

Linear Regression		
Number of obs	=	38,256
F(23, 4533)	=	4.98
Prob > F	=	.000
R-squared	=	0.1726
Root MSE	=	0.10724

(Std. Err. Adjusted for 4,534 clusters in bhid)

Locacq	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Acquired	-0.05	0.09	-0.57	0.572	-0.22	0.12
Acqexp	-0.15	0.05	-2.71	**0.007**	-0.26	-0.04
Typeofdeal	0.01	0.06	0.20	0.839	-0.11	0.14
Acquirertype	0.19	0.06	3.37	**0.001**	0.08	0.30
_IacqXpoppc_1	0.00	0.00	2.97	**0.003**	0.00	0.01
yr_2006	0.01	0.00	4.42	**0.000**	0.00	0.01
yr_2007	0.00	0.00	1.09	0.274	0.00	0.00
yr_2008	0.00	0.00	3.12	**0.002**	0.00	0.00
yr_2009	0.00	0.00	3.03	**0.002**	0.00	0.00
yr_2011	0.00	0.00	-1.55	0.121	0.00	0.00
yr_2012	0.00	0.00	-4.15	**0.000**	-0.01	0.00
yr_2013	-0.01	0.00	-5.40	**0.000**	-0.01	-0.01
yr_2014	0.00	0.00	3.92	**0.000**	0.00	0.01
lg10beds	0.00	0.00	0.70	0.485	0.00	0.01
Gme	0.00	0.01	0.56	0.574	-0.01	0.01
Acute	0.00	0.00	1.43	0.154	0.00	0.01
Govfed	-0.01	0.01	-1.83	0.067	-0.02	0.00
Govlocal	-0.01	0.00	-2.66	**0.008**	-0.01	0.00
Govstate	-0.02	0.00	-4.88	**0.000**	-0.02	-0.01
Proprietary	-0.01	0.00	-2.67	**0.008**	-0.02	0.00
Volnpchurch	-0.01	0.00	-3.34	**0.001**	-0.02	-0.01
Volnpprivate	0.00	0.00	0.21	0.833	-0.01	0.01
poppct_urban	0.00	0.00	2.94	**0.003**	0.00	0.00
_cons	0.00	0.01	-0.88	0.381	-0.02	0.01

Table 25 Local Acquisition Analysis—Modified

Local acquisition without deal and acquirer type variables

Linear Regression	
Number of obs =	38,256
F(21, 4533) =	4.87
Prob > F =	0.000
R-squared =	0.1563
Root MSE =	0.10829

(Std. Err. Adjusted for4,534 clusters in bhid)

Locacq	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Acquired	0.0432457	0.101348	0.43	0.670	-0.15544	0.241936
Acqexp	-0.1937935	0.052942	-3.66	**0.000**	-0.29759	-0.09
_IacqXpoppc_1	0.0044066	0.001305	3.38	**0.001**	0.001848	0.006965
yr_2006	0.0055835	0.001311	4.26	**0.000**	0.003013	0.008155
yr_2007	0.0027617	0.001004	2.75	**0.006**	0.000793	0.004731
yr_2008	0.0020211	0.000959	2.11	**0.035**	0.000141	0.003902
yr_2009	0.0020543	0.000901	2.28	**0.023**	0.000289	0.00382
yr_2011	-0.0014646	0.000948	-1.55	0.122	-0.00332	0.000393
yr_2012	-0.0040315	0.00099	-4.07	**0.000**	-0.00597	-0.00209
yr_2013	-0.010755	0.001913	-5.62	**0.000**	-0.0145	-0.00701
yr_2014	0.0044856	0.001261	3.56	**0.000**	0.002014	0.006957
lg10beds	0.0022264	0.003546	0.63	0.530	-0.00473	0.009178
Gme	0.003596	0.00532	0.68	0.499	-0.00683	0.014025
Acute	0.0043114	0.002937	1.47	0.142	-0.00145	0.010069
Govfed	-0.009232	0.005013	-1.84	0.066	-0.01906	0.000595
Govlocal	-0.0074324	0.002865	-2.59	**0.010**	-0.01305	-0.00182
Govstate	-0.0169949	0.003468	-4.9	**0.000**	-0.02379	-0.0102
Proprietary	-0.0143967	0.005155	-2.79	**0.005**	-0.0245	-0.00429
Volnpchurch	-0.0134494	0.00407	-3.3	**0.001**	-0.02143	-0.00547
Volnpprivate	0.0010489	0.004068	0.26	0.797	-0.00693	0.009024
poppct_urban	0.0001396	4.54E-05	3.07	**0.002**	5.06E-05	0.000229
_cons	-0.0046759	0.005731	-0.82	0.415	-0.01591	0.00656

IV. DISCUSSION

This study's contributions are an early analysis of empirical evidence—in the form of current data recognized for measuring hospital performance—that targets M&A activity in the healthcare industry and provides insight into that activity's relationship to the goals of improving healthcare quality and decreasing its cost. These goals are now key ACA initiatives. Despite that, there is a paucity of current literature that takes a comprehensive look at this topic across the United States. Rather, the body of literature focuses on a single state or a region. As an exception, Spang et al. (2009) performed a comprehensive study using 1988–1997 data from the American Hospital Association (AHA) as a primary source, along with Medicare cost data, to focus on urban, horizontal hospital consolidation to explicate the relationship between consolidation and cost and price outcomes. Because the data preceded the beginning of standardized, nationally reported quality measures, it would not have been possible to include quality metrics, and thus their study could not shed light in this area.

Additionally, this study extends organizational learning theory to the healthcare industry as it relates to horizontal M&As. In its basic form, organizational learning theory suggests that repeating a task improves performance on that task. However, it appears to be important that the repeated task is fundamentally the same. Focus-increasing strategies have been shown to require different skills than focus-decreasing strategies (Daniliuc et al., 2014; Salter & Weinhold, 1981; Shrivastava, 1986; Vestring et al., 2004), so successful acquisition experience in one type of strategy may not translate into a roadmap for future successful acquisitions. One of this study's goals was to examine the relationship between horizontal M&A experience and the target variables—that is, does a healthcare organization learn from prior experience in the M&A arena? Is that learning

observable in study results? My results here support the notion that a hospital organization can "learn," at least in terms of its ability to decrease operating and capital cost-to-charge ratios. This contributes new information to the discussion on M&A activity in the healthcare industry.

Table 26 provides a simplified depiction of the regression results in terms of the statistically significant associations observed for the dependent variables and the independent variables of interest.

Table 26 Summary of Regression Results

Quality Measure (clustered bhid)	acquired	acqexp	typeofdeal	acquirertype	R-Squared
Heart Attack	NS	NS	–	NS	0.3928
Heart Failure	NS	+	NS	NS	0.2985
Pneumonia	NS	NS	+	NS	0.2109
Surgical Infection Prevention	–	NS	NS	+	0.1994

Efficiency Measure (clustered bhid)	acquired	acqexp	typeofdeal	acquirertype	R-Squared
Operating Cost-to-Charge Ratio	–	–	NS	NS	0.2955
Capital Cost-to-Charge Ratio	NS	–	NS	NS	0.1436

Hypotheses 1 and 2 were not consistently supported by the study data. This implies that the apparent hospital acquisition trend may not be improving adherence to the quality of care protocols. It also begs the question: Are the consolidation efforts, which are contributing to M&A activity, helpful or ineffective? If ineffective, as this research on quality data implies, then practitioners going into an M&A should perhaps expect economies of scale, as there does appear to be an association between costs and acquisition, with acquisition lowering costs. Practitioners might also want to add a consultant experienced in the same type of acquisition to their acquisition team. This is especially true if their organization has no experience in M&As; this research suggests

that acquisition experience is associated with lowered operating and capital costs for the acquired facility. From a regulatory standpoint, if horizontal M&As do not harm quality scores, then an antitrust position toward this type of acquisition might be softened.

One exception to the lack of hypotheses support is found in my estimation of the relationship between hospital compliance with heart failure measures and M&A activity: acquisition experience, at least for this measure, might be associated with improved scores and thus supports Hypothesis 2. The nature of this measure must be accounted for here, because other unmeasured variables could be at play. The measure scores the number of heart failure patients that have been given discharge instructions. An example of an unexamined variable that might impact this score is the level of information technology (IT) capabilities that exist before and after acquisition in hospitals whose acquirers have had at least one prior acquisition experience. In such cases, experienced acquirers with a minimum, or higher level, of IT capability might understand that discharge instructions can be automated to print at patient discharge and thus be part of the discharge procedure and included with other discharge documents. To fully explore this possibility, it would be necessary to have IT data for each year, or at least for a reasonable number of the years studied. An acceptable proxy might be Electronic Medical Record (EMR) adoption rates, which is now being implemented at various rates across the healthcare industry. Unfortunately, this measure was not available for all years of the study. Healthcare Information System (HCIS) data is available publicly and at no charge for three years (2009–2011) at www.cms.gov. The industry has been moving toward adoption of EMR legislation (Dranove, Garthwaite, Li, & Ody, 2015),—the Health Information Technology for Economic and Clinical Health Act (HITECH)—was

passed in 2009 to provide financial subsidies to spur the industry on and, at that point, tracking mechanisms were put in place. Some evidence shows that EMR adoption positively impacts patient outcomes (Goodwin, Jinhyung, & Yong-Fang, 2013), though the authors suggest that the substantial financial investment for federal subsidies directed at the project sped up adoption by only two years. Evidence also exists that, in the outpatient care sector, EMR can positively impact both quality of care and efficiency (Xiao et al., 2012), depending on the length of use. The Xiao et al. (2012) study used cross-sectional data from a survey instrument in the physician's office sector. Other researchers conducted a two-year pre/post study on the effects of hospital consolidation on inpatient quality of care using all-payer administrative data and quality metrics from the Agency for Healthcare Research and Quality (AHRQ) (Mutter et al., 2011). Of the 25 quality measures studied, none were TEC measures. For hospitals of any type (acquiring or acquired), the researchers found quality improvement for two measures and reduced quality for two other measures (Mutter et al., 2011, p. 119, Table 3). Acquired or "target" hospitals showed an improved quality in one measure and reduced quality in four measures (Mutter et al., 2011, p. 121, Table 5). This prompted the authors to report that "hospital consolidations appear to have complex, inconsistent effects on quality."

A possible avenue of further research on IT's impact on more action-oriented quality measures could investigate the use of automatic pharmacy dispensation based on the presenting disease state or procedure to be performed. As an example, the surgical infection prevention measure indicates that antibiotics should be given one hour before surgical incision, so antibiotics could be set to automatically dispense with other pre-surgical items.

The data supported Hypotheses 3 and 4 in that the operating cost-to-charge ratio was lower, compared to non-acquired hospitals, for both acquired hospitals and hospitals whose acquirers had prior acquisition experience. The capital cost-to-charge ratio variable delivered mixed results. Acquisition was not associated with a statistically significant difference in this variable, which does not support Hypothesis 5. However, acquisition experience is associated with a lower ratio in a statistically significant manner, which supports Hypothesis 6.

If economies of scale are the desired outcome, care must be taken to monitor M&As so that the hospital cost of care does not decrease while charges to the consumer remain the same or increase. Large regional acquisitions can also raise issues, as they can capture a large market area and reduce competition, thus creating antitrust issues.

The results observed for operating and capital cost-to-charge ratios prompted an investigation of possible underlying contributors to the observed results. An examination of the percent change in inpatient and outpatient charges and hospital costs revealed few statistically significant differences in costs or inpatient charges year-over-year. However, the percent changes in outpatient charges year-over-year showed differences in a positive direction, but this change appeared to be decreasing over time. Results of this specification suggest that the observed decrease in the cost-to-charge ratios observed in association with consolidation might be attributable either to increases in outpatient charges that are outstripping the increases in costs. Or, it might be that the costs and inpatient charges are remaining flat and outpatient charges are still increasing at a statistically significant rate, while decreasing from a percent change perspective.

The latter case appears to be supported by the percent change regressions seen in Table 19–Table 21 in section III.5.1. To this point, Figure 4 shows the raw data across all hospitals studied that report to CMS, and seems to indicate that all three parameters—costs, and inpatient and outpatient charges—are increasing.

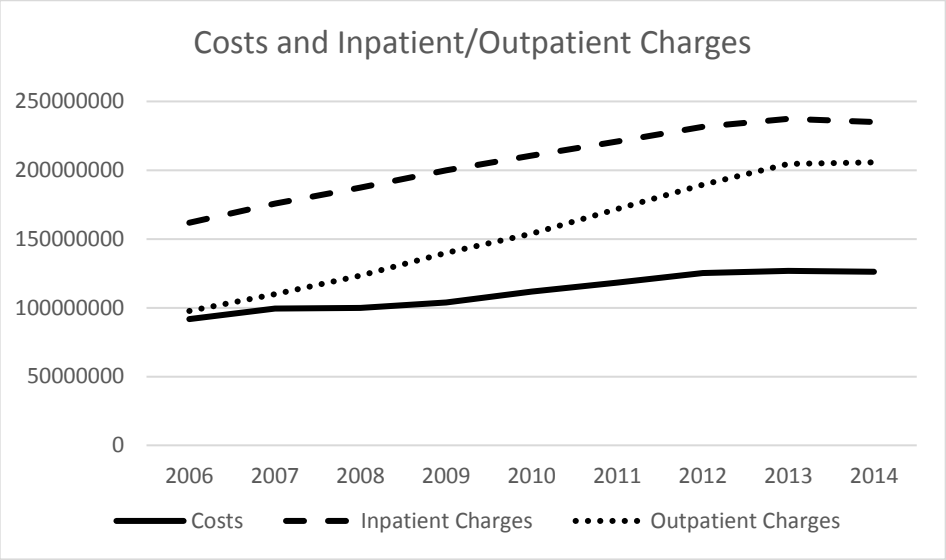


Figure 4 Hospital Costs and Charges

As a point of reference, a visual inspection of US inflation (US Inflation Calculator, 2016) and population growth estimate (*Amercian Community Survey*, 2005-2014) rates, shown in Figure 5, does not appear to explain the rising costs and charges.

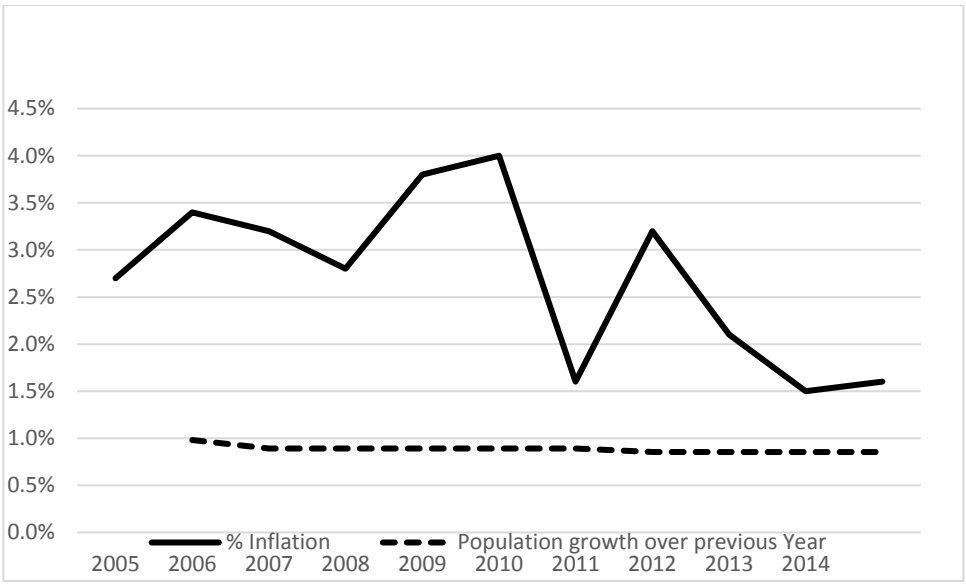


Figure 5 Inflation and Population Gtowth
Growth rates from 2006 to 2014

Of course, if technology and the bundle of services change over time, the increase in charges may be driven by the change in the bundle of services.

When the costs and charges are plotted as a percent change—that is, each previous year is used as a base for the next year's percent growth, as seen in Figure 6 below—a complementary story emerges that implies that the percent change might be decreasing for all three. Although this is not a significant change in the case of costs and inpatient charges, for outpatient charges there is a statistically significant difference year-over-year and, while still positive, the value of the coefficients is becoming smaller (see section 111.5.1 and Table 22).

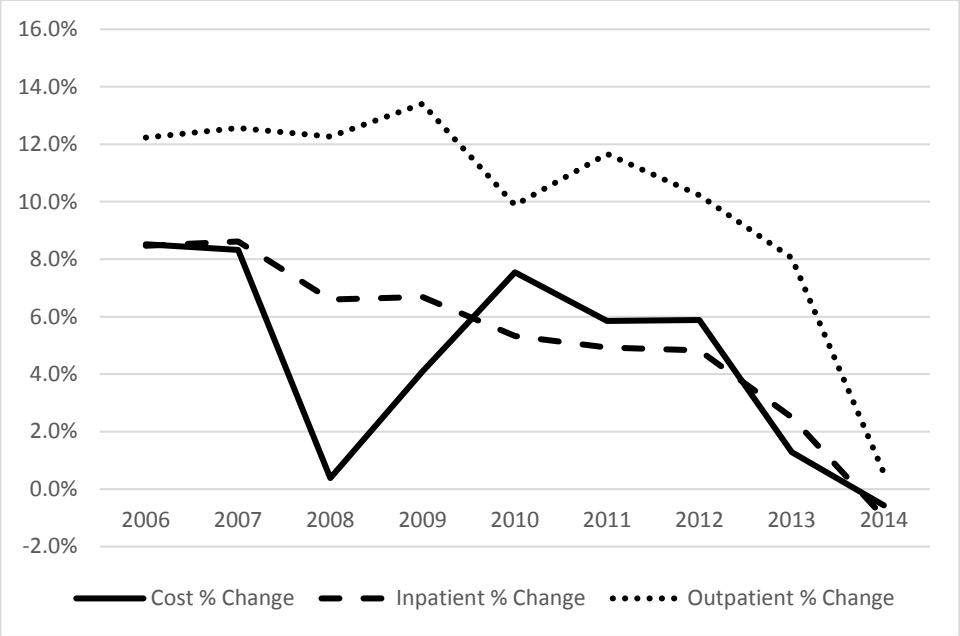


Figure 6 Hospital Percent Change in Costs and Charges Year-over-Year
Costs and Inpatient/Outpatient Charges—Percent Change

The operating cost results found in this study disagree with those found by Azevedo and Mateus (2014, p. 1007) in their study of hospitals in Portugal. When it came to "total variable cost," their research found no significant difference between hospitals that had been merged and those that had not. However, their model did not include a variable for quality. Azevedo and Mateus argued that, while the literature recommends including a quality variable to avoid omission bias, some studies indicated that quality measures were not significant in hospital cost functions; their references here were to work by Carey (2003) and Zuckerman, Hadley, and Iezzoni (1994). Given that they lacked sufficient degrees of freedom,—i.e., their sample size was too small—the authors decided to exclude a quality variable.

In any study, cost must be clearly defined, as "cost" can mean many things, depending on the beholder (or the stakeholder). To the uninsured or direct-pay consumer, cost is the price they pay as reflected in the hospital charge master which contains all

hospital fees for services rendered. Insurance carriers negotiate prices and pay on the consumer's behalf; poor negotiations reflect in a consumer's copay, which is a percentage of what is charged to their insurance carriers. The terms "cost" and "prices" are sometimes used interchangeably. In this study, *hospital costs* refer to the amount that a hospital spends to deliver its services. *Charges* are what hospitals bill the insurance carriers or the patients who pay for medical care directly out of pocket. These definitions are in line with the "cost" and "prices" studied in Spang et al. (2009). The results observed in this study also align with work by Spang et al. (2009), in that they observed negative cost and price coefficients post-merger, in contrast to the positive coefficients observed pre-merger. The current study may present a finer point on the topic in that it evaluates inpatient and outpatient charges separately and uses cost-to-charge ratios rather than the "natural log of total hospital expenses (in and outpatient) per inpatient adjusted day." In the Spang et al. (2009) model, outpatient visits were converted into inpatient days "…based on relative revenue generated by each."

The focus on establishing an ACO structure—a focus-decreasing strategy, given that these are vertical acquisitions—is also contributing to M&A activity in the industry. My results for both quality and efficiency do not address the possible associations between ACO structure and M&As. It remains to be explored whether the ACO focus is effective in improving quality or cost.

Hospital consolidations, or *horizontal mergers,* and the move toward ACO structure are efforts to gain control of as many patient lives as possible to decrease variations in the cost of care and mitigate the risk associated with the new payment system that the ACA is establishing.

In terms of targets to pursue, as Table 27 indicates, larger hospitals (log10 beds) seem to be associated with higher quality scores; the current study also suggests that these hospitals might be unaffected by acquisition and have lower operating and capital cost-to-charge ratios. However, evidence also suggests that the benefit of hospital bed size associated with economies of scale is maximized at approximately 230 beds (Azevedo & Mateus, 2014, p. 1008).

Table 27 Statistically Significant Control Associations
Positive and negative associations

	Quality Measures				Efficiency Measures	
Variable	**Heart Attack**	**Heart Failure**	**Pneumonia**	**Surgical Infection Prevention**	**Operating CCR**	**Capital CCR**
yr_2006	–	–	–	–	+	+
yr_2007	–	–	–	–	+	+
yr_2008	–	–	–	–	+	+
yr_2009	–	–	–	–	NS*	NS
yr_2011	+	+	+	+	NS	NS
yr_2012	+	+	+	+	–	–
yr_2013	+	+	+	+	–	–
yr_2014	+	+	+	N/A	–	–
lg10beds	+	+	+	–	–	–
gme (teaching)	NS	–	–	NS	+	NS
acute	+	NS	NS	–	collinearity	collinearity
govfed	NS	–	NS	–	–	–
govlocal	NS	NS	NS	NS	+	+
govstate	–	–	–	NS	+	NS
proprietary	NS	NS	NS	NS	–	–
volnpchurch	NS	+	+	+	–	–
volnpprivate	NS	+	+	+	NS	NS
poppct_urban	NS	NS	+	+	–	–

* NS = Not statistically significant

Azevedo and Mateus (2014, p. 1008) also found that, with respect to the cost effects of hospital mergers in Portugal, "…..economies of scale are exhausted when a hospital reaches a size of about 230 beds." In fact, the authors suggest that acquiring hospitals larger than 230 beds results in *diseconomies* of scale. This could be an avenue of future research using the US hospital data studied here. The regression results

presented in sections III.3 and III.4 suggest that bed size might consistently influence both quality and cost-to-charge ratios. It would be interesting to determine which characteristics of hospitals vary with bed size.

An additional specification, local acquisition, was investigated to see if it might reflect a desire to capture market share to control pricing. Although local acquisition did not appear to have a statistically significant association with the dependent variables when used as a control in the initial model, when local acquisition was examined as a dependent variable, it appears to be negatively associated with acquirer experience. This might be a function of acquiring locally first and then branching out. A more detailed investigation of this possibility is warranted for future research.

IV.1 Limitations

IV.1.1 *Medicare data.*

The number of Medicare quality data measures studied was limited because many TEC measures were inconsistently categorized or defined. I limited my study to four measures, with one (surgical infection prevention) falling out of the data in 2014. In addition, it's possible that the four quality measures studied have been the most problematic; a subjective observation of the surgical infection prevention data indicates that measure scores might drop off as the reported results approach 100 percent over time. This is a double-edged sword, as it means that the measures studied might be the most recalcitrant to change. Additionally, hospitals may have had the option to report on either of the two heart attack measures, one of which (heart attack measure AMI_8a) endured, while the other (heart attack measure HAM7, later renamed AMI_7a) dropped off consistently until only one hospital reported it in 2014.

Another issue, in terms of consistency, is that the measure protocols and guidelines often changed over time. For example, during the study period, the heart attack PCI protocol, which dictates that a heart attack patient should receive PCI treatment within a certain time limit, went from 120 to 90 minutes; and, in 2009, the pneumonia measure's PNM14 protocol, patients given the most appropriate initial antibiotic, was changed to "initial antibiotic selection for community acquired pneumonia (CAP) immunocompetent patient" when the measure was changed from PNM14 to PN_6.

The focus on quality metrics, both before and after the ACA, limits how much can be attributed to the ACA compared to, say, value-based purchasing or the healthcare industry's own focus on this topic. Focus alone could prompt change regardless of impending or subsequent ACA penalties, which might be brought to bear as in the well-studied "Hawthorne Effect" (Mayo, 1933; Roethlisberger, Dickson, & Wright, 1939).

Finally, the TEC measures are only one category of quality measures; results from other quality measure categories might produce different results. This is an additional area for future research.

IV.1.2 *Hospital characteristics.*

Acquired hospitals may be acquired because they are poor performers. Thus, one avenue of future research might be an investigation of financial data prior to acquisition. Such a pursuit was beyond the scope of this study.

Data on the percent of the population urbanized was from one year, 2010; it is possible that the demographics shifted within the five-year period(s) before and/or after enactment of the ACA.

Market conditions and the economy, in any given year, can impact the course of acquisition events and cause large buyouts, such as the Triad acquisition (19 May 2007). These events can skew the data or decrease M&A activity, as observed after the 2008 crisis (see section III.2 Bloomberg Data).

For M&As, I used the Bloomberg announcement date as the acquisition date. Many acquisitions take a long time to complete; timing can be impacted by both the integration timeline and the degree of integration (Shrivastava, 1986; Vestring et al., 2004; Viegas-Pires, 2013). The study design attempted to compensate for the announcement date versus acquisition date lag by using the 2005 acquisition data to code hospital observations in 2006 as either acquired or not, and eliminating the 2014 acquisition data; thus the actual "acquired" hospitals in the study ran from 2006 to 2013.

IV.1.3 *Capital Cost-to-Charge Ratio.*

In this study, the capital cost-to-charge ratio I examined was that of the acquired hospital. The results might be different if studied in the acquiring hospital, as capital costs for shared services might not be passed down to the acquired hospital from an accounting standpoint. As an example, the IT investment to bring the acquired onboard with the acquiring entity's IT infrastructure or to upgrade the acquired facility's capabilities might be accrued to the acquiring facility. In fact, evidence supports this idea and the results of this study; many researchers have found that the acquirer suffers financially (Chatterjee, 1992; Datta et al., 1992; King et al., 2004; Moeller et al., 2003; Seth et al., 2002) while the acquired experiences improved performance (Asquith & Kim, 1982; Datta et al., 1992; Hansen & Lott Jr, 1996; Malatesta, 1983).

V. CONCLUSIONS

The results here represent an early look at hospital quality measures and their possible relationship to the ACA. For some, 10 years may not seem like a brief period of time, but the timeframe should be put in perspective. After all, healthcare reform has been ongoing for many years ("Health Care Reform Chronology," 2016).

The primary focus of this research centered on the healthcare initiatives of improving quality and decreasing costs. The M&A activity trend, noted by other authors and seen in this study's results, does not appear to be consistently associated with better quality measure scores related to the measures studied. Acquisition does appear to be associated with the efficiency side, as supported by the results observed for the operating cost-to-charge ratio. For practical purposes, this suggests that the decision to endure the expense of acquisition should be based on financial goals, recognizing that improved quality scores may not be realized. Other metrics should be chosen to factor more heavily in the business decision. Further, a mechanism other than M&A activity should be sought to improve quality measure scores, at least for the four measures studied here, which seem to be problematic and enduring. As I discussed in the introduction, Barkema and Schijven (2008) suggested that repeated M&A experience improves efficiency, but perhaps not effectiveness, in the healthcare industry. The results of this study support this idea, assuming that, in healthcare, effectiveness is sought through improved quality measure scores.

It must be remembered that the results of this study demonstrated a statistically significant difference between acquired and unacquired hospitals with regard to the operating cost-to-charge ratio (see section III.3.5. and section III.4,Table 17 Consolidated Results Table). Yet, the same specification, when applied to percent change (see section

III.5.1 and Table 22), did not show a statistically significant difference, though the coefficients ran in the same negative direction, with a larger inpatient than outpatient charge coefficient for the acquired. It might be reasonable to consider the notion that, while acquired hospitals do have better operating cost-to-charge ratios than unacquired hospitals, the unacquired hospitals may be experiencing decreasing cost-to-charge ratios as well. (Note that the CMS reported operating and capital cost-to-charge ratios are adjusted here, as per the Medicare Claims Processing Manual [Government, 2003]).

Although it is tempting to attempt conclusions related to the ACA legislation's effects, the fact that quality metrics existed before the ACA suggests that quality improvement was underway well before the ACA. There is also a troublesome confounding factor: profound legislative changes were anticipated well before the legislation was enacted, which may have prompted changes well before institution of the law. This is particularly true with respect to innovative hospital and/or health systems, such as Geisinger (Paulus, Davis, & Steele, 2008; Robeznieks, 2015), so it is difficult to parse out the effects of the legislation itself. Notwithstanding these complications, statistically significant year-over-year improvement in the quality measure scores studied in this research indicates a steady cadence of improvement both before and after the ACA.

Hospital financial perspectives are also more complex when trying to determine which factors effect cost, as numerous factors are influential. Indeed, the number of factors studied are too numerous to cite here. Still, the fact remains that the percent changes in costs and inpatient charges remained statistically the same over time, while the percent change in outpatient charges increased over time—albeit, at a decreasing

rate—year-over-year, as discussed in Chapter IV (and depicted in Figure 6 Hospital Percent Change in Costs and Charges . Thus, a change in the cost-to-charge ratio in a negative direction might be a step in the right direction, though it may reflect only an increase in inpatient and/or outpatient charges, and not a decrease in cost.

In this study, the rise in outpatient charges may have contributed to or been responsible for the decreases observed in operating cost-to-charge ratios for acquired hospitals and hospitals whose acquirers had experience, as well as the decreased capital cost-to-charge ratio observed in hospitals whose acquirers had experience.

From an academic standpoint and in terms of organizational learning theory, M&A experience may lead to improved financial measures, but not to improved quality measure scores. The exception here is the heart failure measure. As I discussed earlier, this exception may be due to the nature of the measure and to IT's potential to improve it.

When extending organizational learning theory to M&A activity in the healthcare industry, it appears that the financial metrics may be more influenced than the quality aspect; again, this would support Barkema and Schijven (2008). From a practical standpoint, if an acquirer with experience is pursuing hospital consolidation, this experience seems to be associated with lower hospital costs. However, results from the literature suggest that practitioners with experience should be mindful of the association between integration activity intensity and performance that falls below expectations when pursuing an ACO structure through M&As.

Organizational learning theory seems to apply best to the healthcare industry in relation to the efficiency measures studied. However, it is crucial to ensure that the prospective task to be repeated has been studied and found to be the same task previously

experienced. Further, focus-increasing strategies seem to require different skills than focus-decreasing strategies. In the current environment, many healthcare organization are participating in both. Finally, identifying the correct actions to achieve the best results is the key to realizing expectations.

The implication that acquisition does not harm quality and might decrease costs would be good news for the consumers of and payers for healthcare services, as long as some of the savings are passed down. It also might also provide some relief for regulatory bodies concerned with antitrust issues, in that M&A activity does not seem to negatively impact consumer welfare.

Additional areas for future research include understanding more fully which characteristics of strategy, structure, process, and other variables that acquirers put in place lead to a decrease in the operating cost-to-charge ratio. Also, regarding the capital cost-to-charge ratio, what do experienced acquirers do that leads to a decrease in this ratio, and what are the strategies behind those actions? Further, certain ownership types—in particular, federal government and proprietary-owned hospitals—were observed to be associated with statistically significant positive coefficients in year-over-year changes in outpatient charges, while voluntary nonprofit private ownerships appear to have a negative association. Acute care hospitals have a negative coefficient here, reflecting lower outpatient charges, while a positive association was found for teaching hospitals. What variables are driving these differences? Pursuing these avenues of research might assist in the continuous process of driving down costs and charges in the healthcare industry.

APPENDICES

Appendix A Data Demographics and Data Sets

Appendix A.1—Billians Health Data Demographics

Billians Data
BHDID
Name
Affiliate BHDID
Affiliate Name
Affiliate Type
Affiliate Description
State
City
Street Zip
Street Address
Total Beds
Staffed Beds
Acute Beds
Phone
Website
Fax
Acute Care
Medical/Surgical
Critical Access
Income Statement Net Patient Revenue
Income Statement Patient Revenue
Income Statement Operating Expenses
Income Statement Net Margin
Income Statement Net Income
Directory Code
Medicare Provider Number
NPI Number
ER Visits
Statistics Discharges

Appendix A.2—Medicare Data Set Demographics

Hospital General Information	**Medicare Data Set—Structural Measures**	**Medicare Data Set—HCAHPS Patient Satisfaction Survey**	**Medicare Data Set—Healthcare Associated infections**
Provider ID	***Provider ID***	***Provider ID***	***Provider ID***
Hospital Name	Hospital Name	Hospital Name	Hospital Name
Address	Address	Address	Address
City	City	City	City
State	State	State	State
ZIP Code	ZIP Code	ZIP Code	ZIP Code
County Name	County Name	County Name	County Name
Phone Number	Phone Number	Phone Number	Phone Number
Hospital Type	Measure Name	HCAHPS Measure ID	Measure Name
Hospital Ownership	Measure ID	HCAHPS Question	Measure ID
Emergency Services	Measure Response	HCAHPS Answer Description	Compared to National
	Footnote	HCAHPS Answer Percent	***Score***
	Measure Start Date	Number of Completed Surveys	Footnote
	Measure End Date	Survey Response Rate Percent	Measure Start Date
		Footnote	Measure End Date
		Measure Start Date	Year
		Measure End Date	

Medicare Data Set—Timely and Effective Care	**Medicare Data Set—Readmissions, Complications, and Deaths**	**Medicare Data Set—Readmissions Reduction**
Provider ID	***Provider ID***	Hospital Name
Hospital Name	Hospital Name	***Provider Number***
Address	Address	State
City	City	Measure Name
State	State	Number of Discharges
ZIP Code	ZIP Code	Footnote
County Name	County Name	Excess Readmission Ratio
Phone Number	Phone Number	Predicted Readmission Rate
Condition	Measure Name	Expected Readmission Rate
Measure ID	Measure ID	Number of Readmissions
Measure Name	Compared to National	Start Date
Score	Denominator	End Date
Sample	***Score***	
Footnote	Lower Estimate	
Measure Start Date	Higher Estimate	
Measure End Date	Footnote	
	Measure Start Date	
	Measure End Date	

Appendix A.3—Medicare Acronyms

Acronym	Meaning
AMI	Acute Myocardial Infarction
Avg	Average
CAC	Children's Asthma Care
COMP-HP-KNEE	Total Hip/Knee Arthoroplasty 30-Day Complication Rate
ED	Emergency Department
FTNT	Footnote
HACRP	Hospital-Acquired Conditions Reduction Program
HAI	Healthcare Associated Infections
HBIPS	Hospital-Based Inpatient Psychiatric Services
HCAHPS	Hospital Consumer Assessment of Healthcare Providers and Systems
HF	Heart Failure
HIT	Health Information Technology
HRRP	Hospital Readmissions Reduction Program
HVBP	Hospital Value-Based Purchasing
IMG	Imaging
IMM	Immunization
IPFQR	Inpatient Psychiatric Facility Quality Reporting
IQR	Inpatient Quality Reporting
MORT	Mortality
MSPB	Medicare Spending Per Beneficiary (also known as *SPP for Spending Per Patient*)
MSR	Measure
MPV	Medicare Payments and Volume
MV	Medicare Volume
NQF	National Quality Forum
OIE	Outpatient Imaging Efficiency
OP	Outpatient
OQR	Outpatient Quality Reporting
PCHQR	PPS-Exempt Cancer Hospital Quality Reporting
PN	Pneumonia
PSI	Patient Safety Indicators
READM	Readmissions
SCIP	Surgical Care Improvement Project
SM	Structural Measures
STK	Stroke
TPS	Total Performance Score
VTE	Venous Thromboembolism

Appendix A.4—Medicare Data Set Components

Medicare Data Set—Structural Measures	
Measure ID	**Measure Name**
OP_12	Able to Receive Lab Results Electronically
OP_17	Able to Track Patients' Lab Results, Tests, and Referrals Electronically Between Visits
OP_25	Safe Surgery Checklist Use
SM_PART_CARD	Cardiac Surgery Registry
SM_PART_GEN_SURG	General Surgery Registry
SM_PART_NURSE	Nursing Care Registry
SM_PART_STROKE	Stroke Care Registry
ACS_REGISTRY	Multispecialty Surgical Registry

Medicare Data Set HCAHPS—Patient Satisfaction Survey		
HCAHPS Measure ID	**HCAHPS Question**	**HCAHPS Answer Description**
H_CLEAN_HSP_AP	Patients who reported that their room and bathroom were "Always" clean	Room was "always" clean
H_CLEAN_HSP_SN_P	Patients who reported that their room and bathroom were "Sometimes" or "Never" clean	Room was "sometimes" or "never" clean
H_CLEAN_HSP_U_P	Patients who reported that their room and bathroom were "Usually" clean	Room was "usually" clean
H_COMP_1_A_P	Patients who reported that their nurses "Always" communicated well	Nurses "always" communicated well
H_COMP_1_SN_P	Patients who reported that their nurses "Sometimes" or "Never" communicated well	Nurses "sometimes" or "never" communicated well
H_COMP_1_U_P	Patients who reported that their nurses "Usually" communicated well	Nurses "usually" communicated well
H_COMP_2_A_P	Patients who reported that their doctors "Always" communicated well	Doctors "always" communicated well
H_COMP_2_SN_P	Patients who reported that their doctors "Sometimes" or "Never" communicated well	Doctors "sometimes" or "never" communicated well
H_COMP_2_U_P	Patients who reported that their doctors "Usually" communicated well	Doctors "usually" communicated well
H_COMP_3_A_P	Patients who reported that they "Always" received help as soon as they wanted	Patients "always" received help as soon as they wanted
H_COMP_3_SN_P	Patients who reported that they "Sometimes" or "Never" received help as soon as they wanted	Patients "sometimes" or "never" received help as soon as they wanted
H_COMP_3_U_P	Patients who reported that they "Usually" received help as soon as they wanted	Patients "usually" received help as soon as they wanted
H_COMP_4_A_P	Patients who reported that their pain was "Always" well controlled	Pain was "always" well controlled
H_COMP_4_SN_P	Patients who reported that their pain was "Sometimes" or "Never" well controlled	Pain was "sometimes" or "never" well controlled
H_COMP_4_U_P	Patients who reported that their pain was "Usually" well controlled	Pain was "usually" well controlled
H_COMP_5_A_P	Patients who reported that staff "Always" explained about medicines before giving it to them	Staff "always" explained

Table Continued Next Page

Medicare Data Set—HCAHPS Patient Satisfaction Survey (cont.)		
HCAHPS Measure ID	**HCAHPS Question**	**HCAHPS Answer Description**
H_COMP_5_SN_P	Patients who reported that staff "Sometimes" or "Never" explained about medicines before giving it to them	Staff "sometimes" or "never" explained
H_COMP_5_U_P	Patients who reported that staff "Usually" explained about medicines before giving it to them	Staff "usually" explained
H_COMP_4_U_P	Patients who reported that their pain was "Usually" well controlled	Pain was "usually" well controlled
H_COMP_7_SA	Patients who "Strongly Agree" they understood their care when they left the hospital	Patients who “Strongly Agree” they understood their care when they left the hospital
H_HSP_RATING_0_6	Patients who gave their hospital a rating of 6 or lower on a scale from 0 (lowest) to 10 (highest)	Patients who gave a rating of "6" or lower (low)
H_HSP_RATING_7_8	Patients who gave their hospital a rating of 7 or 8 on a scale from 0 (lowest) to 10 (highest)	Patients who gave a rating of "7" or "8" (medium)
H_HSP_RATING_9_10	Patients who gave their hospital a rating of 9 or 10 on a scale from 0 (lowest) to 10 (highest)	Patients who gave a rating of "9" or "10" (high)
H_QUIET_HSP_A_P	Patients who reported that the area around their room was "Always" quiet at night	"Always" quiet at night
H_QUIET_HSP_SN_P	Patients who reported that the area around their room was "Sometimes" or "Never" quiet at night	"Sometimes" or "never" quiet at night
H_QUIET_HSP_U_P	Patients who reported that the area around their room was "Usually" quiet at night	"Usually" quiet at night
H_RECMND_DN	Patients who reported NO, they would probably not or definitely not recommend the hospital	"NO", patients would not recommend the hospital (they probably would not or definitely would not recommend it)
H_RECMND_DY	Patients who reported YES, they would definitely recommend the hospital	"YES", patients would definitely recommend the hospital
H_RECMND_PY	Patients who reported YES, they would probably recommend the hospital	"YES", patients would probably recommend the hospital

Medicare Data Set—Readmissions, Complications, and Deaths	
Measure ID	**Measure Name**
COMP_HIP_KNEE	Rate of complications for hip/knee replacement patients
MORT_30_AMI	Acute myocardial infarction (AMI) 30-day mortality rate
MORT_30_COPD	Death rate for chronic obstructive pulmonary disease (COPD) patients
MORT_30_HF	Heart failure (HF) 30-day mortality rate
MORT_30_PN	Pneumonia (PN) 30-day mortality rate
MORT_30_STK	Death rate for stroke patients
PSI_12_POSTOP_PULMEMB_DVT	Serious blood clots after surgery
PSI_14_POSTOP_DEHIS	A wound that splits open after surgery on the abdomen or pelvis
PSI_15_ACC_LAC	Accidental cuts and tears from medical treatment
PSI_4_SURG_COMP	Deaths among patients with serious treatable complications after surgery
PSI_6_IAT_PTX	Collapsed lung due to medical treatment
PSI_90_SAFETY	Serious complications
READM_30_AMI	Acute myocardial infarction (AMI) 30-day readmission rate
READM_30_COPD	Rate of unplanned readmission for chronic obstructive pulmonary disease (COPD) patients
READM_30_HF	Heart failure (HF) 30-day readmission rate
READM_30_HIP_KNEE	Rate of readmission after hip/knee surgery
READM_30_HOSP_WIDE	Rate of readmission after discharge from hospital (hospital-wide)
READM_30_PN	Pneumonia (PN) 30-day readmission rate
READM_30_STK	Rate of unplanned readmission for stroke patients

Medicare Data Set—Hospital Readmissions Reduction Program (HRRP)	
Measure Name	**Description**
READM-30-AMI-HRRP	Readmission, for any cause, within 30 days of index hospitalization for AMI
READM-30-COPD-HRRP	Readmission, for any cause, within 30 days of index hospitalization for COPD
READM-30-HF-HRRP	Readmission, for any cause, within 30 days of index hospitalization for HF
READM-30-HIP-KNEE-HRRP	Readmission, for any cause, within 30 days of index hospitalization for hip or knee replacement
READM-30-PN-HRRP	Readmission, for any cause, within 30 days of index hospitalization for Pneumonia

Medicare Data Set—Outpatient Imaging Efficiency	
Measure ID	**Measure Name**
OP_10	Abdomen CT use of contrast material
OP_11	Thorax CT use of contrast material
OP_13	Outpatients who got cardiac imaging stress tests before low-risk outpatient surgery
OP_14	Outpatients with brain CT scans who got a sinus CT scan at the same time
OP_8	MRI lumbar spine for low back pain
OP_9	Mammography follow-up rates

Medicare Data Set—Medicare Volume
Diagnosis Related Group
Extracranial procedures w/ CC
Extracranial procedures w/o CC/MCC
Chronic obstructive pulmonary disease w/ MCC
Chronic obstructive pulmonary disease w/ CC
Chronic obstructive pulmonary disease w/o CC/MCC
Simple pneumonia and pleurisy w/ MCC
Cardiac valve and oth maj cardiothoracic proc w/o card cath w/ MCC
Cardiac valve and oth maj cardiothoracic proc w/o card cath w/ CC
Cardiac valve and oth maj cardiothoracic proc w/o card cath w/o CC/MCC
Cardiac defib implant w cardiac cath w/o AMI/HF/shock w/ MCC
Cardiac defib implant w cardiac cath w/o AMI/HF/shock w/o MCC
Cardiac defibrillator implant w/o cardiac cath w/ MCC
Cardiac defibrillator implant w/o cardiac cath w/o MCC
Coronary bypass w/o cardiac cath w/ MCC
Coronary bypass w/o cardiac cath w/o MCC
Major cardiovasc procedures w/ MCC or thoracic aortic aneurysm repair
Permanent cardiac pacemaker implant w/ CC
Permanent cardiac pacemaker implant w/o CC/MCC
Perc cardiovasc proc w drug-eluting stent w/o MCC
Acute myocardial infarction, discharged alive w/ MCC
Acute myocardial infarction, discharged alive w/ CC
Acute myocardial infarction, discharged alive w/o CC/MCC
Heart failure and shock w/ MCC
Heart failure and shock w/ CC
Heart failure and shock w/o CC/MCC
Chest pain
Stomach, esophageal duodenal proc w/o CC/MCC
Major small and large bowel procedures w/ MCC
Major small and large bowel procedures w CC
Major small and large bowel procedures w/o CC/MCC

Table continues on next page

Medicare Data Set—Medicare Volume (cont)
Hernia procedures except inguinal and femoral w/ MCC
Hernia procedures except inguinal and femoral w/ CC
Hernia procedures except inguinal and femoral w/o CC/MCC
Cholecystectomy except by laparoscope w/o c.d.e. w/ MCC
Laparoscopic cholecystectomy w/o c.d.e. w/ MCC
Laparoscopic cholecystectomy w/o c.d.e. w/ CC
Laparoscopic cholecystectomy w/o c.d.e. w/o CC/MCC
Spinal fusion except cervical w/ MCC
Spinal fusion except cervical w/o MCC
Bilateral or multiple major joint procs of lower extremity w/o MCC
Revision of hip or knee replacement w/ MCC
Revision of hip or knee replacement w/ CC
Major joint replacement or reattachment of lower extremity w/ MCC
Major joint replacement or reattachment of lower extremity w/o MCC
Cervical spinal fusion w/ MCC
Cervical spinal fusion w/ CC
Cervical spinal fusion w/o CC/MCC
Biopsies of musculoskeletal system and connective tissue w/ MCC
Biopsies of musculoskeletal system and connective tissue w/ CC
Biopsies of musculoskeletal system and connective tissue w/o CC/MCC
Back and neck proc exc spinal fusion w CC/MCC or disc device/neurostim
Back and neck proc exc spinal fusion w/o CC/MCC
Major shoulder or elbow joint procedures w CC/MCC
Other musculoskelet sys and conn tiss O.R. proc w MCC
Diabetes w MCC
Kidney and ureter procedures for neoplasm w MCC
Kidney and ureter procedures for neoplasm w CC
Kidney and ureter procedures for neoplasm w/o CC/MCC
Kidney and ureter procedures for non-neoplasm w MCC
Other kidney and urinary tract procedures w/ MCC
Other kidney and urinary tract procedures w/ CC
Other kidney and urinary tract procedures w/o CC/MCC
Transurethral prostatectomy w/ CC/MCC
Transurethral prostatectomy w/o CC/MCC
Uterine and adnexa proc for non-malignancy w/o CC/MCC
Female reproductive system reconstructive procedures
Bilateral or multiple major joint procs of lower extremity w/ MCC
Revision of hip or knee replacement w/o CC/MCC
Transurethral procedures w/ MCC
Major shoulder or elbow joint procedures w/o CC/MCC

Medicare Data Set—Medicare Spending per Patient	
Measure ID	**Measure Name**
MSPB_1	Medicare hospital spending per patient (Medicare spending per beneficiary)

Medicare Data Set—Medicare Spending by Claim	
Period	**Claim Type**
1–3 days Prior to Index Hospital Admission	Home Health Agency
1–3 days Prior to Index Hospital Admission	Hospice
1–3 days Prior to Index Hospital Admission	Inpatient
1–3 days Prior to Index Hospital Admission	Outpatient
1–3 days Prior to Index Hospital Admission	Skilled Nursing Facility
1–3 days Prior to Index Hospital Admission	Durable Medical Equipment
1–3 days Prior to Index Hospital Admission	Carrier
Complete Episode	Total

Appendix A.5—Medicare Data Set Components—Timely and Effective Care

Medicare Data Set—Timely and Effective Care - 2005			
2005 Measure ID	**2013 Measure ID**	**Condition**	**Measure Name**
HAM1	AMI_2	Heart Attack	Patients Given Aspirin at Discharge
HAM2	OP_4	Heart Attack	Patients Given Aspirin at Arrival
HAM3		Heart Attack	Patients Given Beta Blocker at Arrival
HAM4	AMI_8a 90 min	Heart Attack	Patients Given PCI within 120 Minutes Of Arrival
HAM5		Heart Attack	Patients Given Smoking Cessation Advice/Counseling
HAM6		Heart Attack	Patients Given ACE Inhibitor or ARB for Left Ventricular Systolic Dysfunction (LVSD)
HAM7		Heart Attack	Patients Given Thrombolytic Medication within 30 Minutes of Arrival
HAM8		Heart Attack	Patients Given Beta Blocker at Discharge
HFM10	HF_1	Heart Failure	Patients Given Discharge Instructions
HFM11	HF_2	Heart Failure	Patients Given Assessment of Left Ventricular Function (LVF)
HFM13		Heart Failure	Patients Given Smoking Cessation Advice/Counseling
HFM9		Heart Failure	Patients Given ACE Inhibitor or ARB for Left Ventricular Systolic Dysfunction (LVSD)
PNM14	PN_6	Pneumonia	Patients Given the Most Appropriate Initial Antibiotic(s)
PNM15		Pneumonia	Patients Given Initial Antibiotic(s) within 4 Hours After Arrival
PNM16		Pneumonia	Patients Having a Blood Culture Performed Prior to First Antibiotic Received in Hospital
PNM17		Pneumonia	Patients Assessed and Given Pneumococcal Vaccination
PNM18		Pneumonia	Patients Given Smoking Cessation Advice/Counseling
PNM19		Pneumonia	Patients Given Oxygenation Assessment
SIPM20	SCIP_INF_1	Surgical Infection Prevention	Surgery Patients Who Received Preventative Antibiotic(s) One Hour Before Incision
SIPM21	SCIP_INF_3	Surgical Infection Prevention	Surgery Patients Whose Preventative Antibiotic(s) Are Stopped within 24 Hours After Surgery

Medicare Data Set—Timely and Effective Care - 2013	
Measure ID	**Measure Name**
AMI_10	Statin at discharge
AMI_2	Aspirin prescribed at discharge
AMI_7a	Fibrinolytic therapy received within 30 minutes of hospital arrival
AMI_8a	Primary PCI received within 90 minutes of hospital arrival
ED_1b	ED1
ED_2b	ED2
EDV	Emergency Department volume
HF_1	Discharge instructions
HF_2	Evaluation of LVS function
HF_3	ACEI or ARB for LVSD
IMM_2	Immunization for influenza
IMM_3_FAC_ADHPCT	Healthcare workers given influenza vaccination
OP_1	Median time to fibrinolysis
OP_18b	OP 18
OP_2	Fibrinolytic therapy received within 30 minutes of ED arrival
OP_20	Door to diagnostic eval
OP_21	Median time to pain med
OP_22	Left before being seen
OP_23	Head CT results
OP_3b	Median time to transfer to another facility for acute coronary intervention
OP_4	Aspirin at arrival
OP_5	Median time to ECG
OP_6	Prophylactic antibiotic initiated within one hour prior to surgical incision
OP_7	Prophylactic antibiotic selection for surgical patients
PC_01	Percent of newborns whose deliveries were scheduled early (1–3 weeks early) when a scheduled delivery was not medically necessary
PN_6	Initial antibiotic selection for CAP in immunocompetent patient
SCIP_CARD_2	Surgery patients on a beta blocker prior to arrival who received a beta blocker during the perioperative period
SCIP_INF_1	Prophylactic antibiotic received within 1 hour prior to surgical incision
SCIP_INF_10	Surgery patients with perioperative temperature management
SCIP_INF_2	Prophylactic antibiotic selection for surgical patients
SCIP_INF_3	Prophylactic antibiotics discontinued within 24 hours after surgery end time
SCIP_CARD_2	Surgery patients on a beta blocker prior to arrival who received a beta blocker during the perioperative period
SCIP_INF_4	Cardiac surgery patients with controlled 6 a.m. postoperative blood glucose
SCIP_INF_9	Postoperative urinary catheter removal
SCIP_VTE_2	Surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to or after surgery
STK_1	Venous thromboembolism (VTE) prophylaxis
STK_10	Assessed for rehabilitation
STK_2	Discharged on antithrombotic therapy
STK_3	Anticoagulation therapy for atrial fibrillation/flutter
STK_4	Thrombolytic therapy
STK_5	Antithrombotic therapy by end of hospital day 2
STK_6	Discharged on statin medication
STK_8	Stroke education
VTE_1	Venous thromboembolism prophylaxis

Table continues on next page

Medicare Data Set—Timely and Effective Care (cont)	
Measure ID	**Measure Name**
VTE_2	ICU venous thromboembolism prophylaxis
VTE_3	Anticoagulation overlap therapy
VTE_4	Unfractionated heparin with dosages/platelet count monitoring
VTE_5	Warfarin therapy discharge instructions
VTE_6	Incidence of potentially preventable VTE
CAC_1	Relievers for inpatient asthma
CAC_2	Systemic corticosteroids for inpatient asthma
CAC_3	Home management plan of care document

Appendix A.6—Centers for Medicare and Medicaid Services (CMS) Reports

Appendix A.6.1—CMS IME_GME Report

Medicare Provider Number—PROVIDER_NUMBER
Fiscal Year Start Date—FYB
Fiscal Year End Date—FYE
Claims Status—STATUS
Demographics—HOSPITAL_Name, Street_Addr, Po_Box, City, State, Zip_Code, County
Indirect Medical Education Payments—IME1, IME2, IME3
Disproportionate Share Hospital Payments—DSH1, DSH2, DSH3
DSH_SHARE_PERCENTAGE
Direct Graduate Medical Education Payments—GME_PART_A, GME_PART_B
TOTAL_HOSPITAL_BEDS
TOTAL_HOSPITAL_BED_DAYS_AVAILABLE
TOTAL_HOSPITAL_MEDICARE_DAYS
TOTAL_HOSPITAL_MEDICAID_DAYS
TOTAL_HOSPITAL_DAYS
INTERNS_AND_RESIDENTS
TOTAL_HOSPITAL_EMPLOYEES_ON_PAYROL
TOTAL_HOSPITAL_NON_PAID_WORKERS
TOTAL_HOSPITAL_MEDICARE_DISCHARGES
TOTAL_HOSPITAL_MEDICAID_DISCHARGES
TOTAL_HOSPITAL_DISCHARGES
MEDICAID_HMO_DISCHARGES
MEDICAID_HMO_IPF_SUBPROVIDER
MEDICAID_HMO_IRF_SUBPROVIDER
MEDICAID_IPF_SUBPROVIDER
MEDICAID_IRF_SUBPROVIDER
TOTAL_DISCHARGES_SUBPROVIDER_IPF
TOTAL_DISCHARGES_SUBPROVIDER_IRF

Appendix A.6.2—CMS Case Mix Index Report

Worksheet C, Part I (2010 forms) Form CMS-2552-10
C000001_20000_00500—Column 5 = Total Costs
C000001_20000_00600—Column 6 = Inpatient Charges
C000001_20000_00700—Column 7 = Outpatient Charges
URL—https://www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/Cost-Reports/Cost-Reports-by-Fiscal-Year-Items/HOSP-DL-2006.html?DLPage=4&DLEntries=10&DLSort=0&DLSortDir=ascending

Appendix A.6.3—FY_ _ _ FR Impact _File Report

Provider Number	Six character provider number; the first two digits are the state code
Name	Hospital Name—from OSCAR
Geographic Labor Market Area	The Geographic CBSA location for the provider
Pre Reclass Labor Market Area	Pre-Reclass CBSA
Payment Labor Market Area (for purposes of Capital and DSH)	Payment CBSA (urban vs. rural) for purposes of determining capital & DSH payments
Section 505 wage adjustment	A "YES" denotes providers eligible to receive a wage index adjustment under Sec. 505 of P.L. 108-173 for FY 2008
Section 505 eligible	A "YES" denotes providers eligible to receive a wage index adjustment under Sec. 505 of P.L. 108-173 for FY 2008
Section 401 hospital	A "SEC401" denotes urban providers redesignated as rural under CFR 412.103—Sec 401 of BIPA
Post Reclass Wage Index	Post reclass wage index after applying the MGCRB reclassifications, the P.L. 108-173 Sec 505 adjustments where applicable for FY 2008 and reflects the application of the rural floor budget neutrality as proposed in this rule
COLA	Cost of living adj. for providers in AK & HI for operating PPS
RESBED	Used to determine IME factor for operating PPS payments
SSA COUNTY CODE	SSA state county code. SSA system for identifying county in which provider is geographically located. Can be used in conjunction with the msa/cbsa crosswalk file.
HSP Rate	82/87/96 Hospital Specific Rate updated to FY2008 for SCH providers; 82/87 hospital specific rate for MDH providers updated to FY 2008
RDAY	Used to calculate the IME adjustment for Capital PPS
BEDS	From Medicare Cost Reports
ADC	Average Daily Census from Medicare Cost Report
OPCCR	From Provider Specific File; ratio of Medicare operating costs to Medicare covered charges
CPCCR	From Provider Specific File; ratio of Medicare capital costs to Medicare covered charges
DSHPCT	Disproportionate Share Percent as determined from cost report data & SSA data
POST RECLASS Labor Market Area	Post Reclass CBSA for FY 2008
Puerto Rico Specific Post Reclass wage index	Puerto Rico Specific post reclass wage index after applying the MGCRB reclassifications and the P.L. 108-173 Sec 505 adjustments where applicable for FY 2008
Provider Type	Type of provider. Key: 0=IPPS; 7=RURAL REFERRAL CENTER; 8=INDIAN; 14=MEDICARE DEPENDENT SMALL RURAL HOSP; 15 MDH/RRC 16/17=SCH; 21/22=ESSENTIAL ACCESS CMTY HSP
LUGAR	Provider is located in a Lugar County as defined in 1886(d)(8)(B)
RECLASS	Reclass Status FY 2008: N: provider did not reclassify; W: provider reclassified for wage index ; L provider reclassified under 1886(d)(8)(B) of the SSA; S: provider redesignated as rural under Sec. 401 of BIPA
BILLS	Total cases for the provider from the FY2006 MEDPAR March 2007 Updt
CASETA24	Transfer Adjusted Cases under Grouper V24 FY 2007 PAC trans policy
TACMIV24	Transfer Adjusted Case Mix Index under Grouper V24
CMIV24	Case Mix Index under Grouper V24 for SCH providers paid under their hospital specific rate
CASETA25	Transfer Adjusted Cases under Grouper V25
TACMIV25	Transfer Adjusted Case Mix Index under Grouper V25
CMIV25	Case Mix Index under Grouper V25 for SCH providers paid under their hospital specific rate
REGION	1=NEW ENGLAND; 2=MIDDLE ATLANTIC; 3=SOUTH ATLANTIC; 4=EAST NORTH CENTRAL; 5=EAST SOUTH CENTRAL; 6=WEST NORTH CENTRAL; 7=WEST SOUTH CENTRAL; 8-=MOUNTAIN; 9=PACIFIC; 40=PUERTO RICO
URGEO	Large Urban, Other Urban or Rural designation of the providers geographic CBSA
URSPA	Urban or Rural designation based on payment CBSA
TCHOP	IME adjustment factor for Operating PPS
TCHCP	IME adjustment factor for Captial PPS
Post Reclass GAF	Post Reclass Geographic adjustment factor (GAF) for Capital FY 2008
Puerto Rico Specific Post Reclass GAF	Post Reclass GAF for Capital for Puerto Rico Providers FY 2008
COLACP	Cost of living adj. for providers in AK & HI for capital PPS
DSHOPG	Operating Disproportionate Share (DSH) adjustment
DSHCPG	Capital Disproportionate Share (DSH) adjustment
OUT08F	Estimated operating outlier payments as a percentage of the provider's federal operating PPS payments
COUT08F	Estimated capital outlier payments as a percentage of the provider's federal capital PPS payments
MCR_PCT	Medicare days as a percent of total inpatient days (not available for all HSPs)

Appendix B Correlation matrices

Appendix B.1 Correlation matrix—all variables

Table 28 Correlation matrix—all variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	1.00																								
2	0.46	1.00																							
3	0.44	0.43	1.00																						
4	0.27	0.29	0.27	1.00																					
5	-0.05	-0.13	-0.11	-0.05	1.00																				
6	-0.01	-0.07	-0.07	-0.06	0.58	1.00																			
7	0.00	0.05	0.06	0.02	-0.08	-0.03	1.00																		
8	-0.03	0.03	0.02	-0.01	-0.09	-0.05	**0.72**	1.00																	
9	-0.02	-0.05	-0.04	-0.04	0.02	0.02	0.05	0.03	1.00																
10	-0.02	-0.05	-0.04	-0.05	0.01	0.03	0.06	0.05	**0.94**	1.00															
11	-0.01	-0.04	-0.04	-0.04	0.01	0.03	0.04	0.03	**0.64**	**0.63**	1.00														
12	0.02	0.05	0.05	0.01	-0.06	-0.01	**0.74**	**0.60**	0.04	0.04	0.04	1.00													
13	0.02	0.04	0.05	0.03	-0.03	0.00	**0.75**	0.36	0.06	0.05	0.04	0.56	1.00												
14	0.03	0.01	0.01	-0.01	-0.25	-0.22	0.02	-0.01	-0.01	0.00	-0.01	0.01	0.06	1.00											
15	0.01	0.05	0.06	0.02	-0.08	-0.03	**0.99**	**0.69**	0.05	0.06	0.04	**0.72**	**0.77**	0.05	1.00										
16	-0.04	-0.02	0.01	0.01	-0.01	0.01	0.38	0.10	0.03	0.02	0.01	0.31	0.49	0.09	0.41	1.00									
17	0.04	-0.02	-0.01	0.03	-0.08	-0.26	-0.07	-0.08	-0.03	-0.04	-0.02	-0.08	-0.04	0.31	-0.06	0.00	1.00								
18	-0.08	-0.08	-0.08	-0.05	0.04	-0.10	-0.02	-0.05	0.00	0.00	0.00	-0.03	0.00	0.19	-0.02	0.02	0.41	1.00							
19	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.						
20	0.00	0.01	0.01	0.00	0.00	-0.01	0.01	0.01	0.00	-0.01	0.00	-0.01	0.01	0.01	0.01	0.02	0.02	0.02	.	1.00					
21	-0.04	-0.03	-0.05	-0.02	0.10	0.07	-0.04	-0.03	0.00	-0.01	-0.01	-0.03	-0.03	-0.06	-0.04	-0.03	-0.01	-0.02	.	-0.02	1.00				
22	-0.06	-0.06	-0.06	-0.03	0.09	-0.02	-0.03	-0.02	0.01	0.01	0.00	-0.02	-0.02	0.05	-0.03	-0.02	0.10	0.09	.	-0.01	-0.03	1.00			
23	-0.02	0.03	0.02	-0.06	-0.31	-0.08	0.19	0.19	0.01	0.05	0.03	0.17	0.09	0.04	0.18	0.02	-0.23	-0.17	.	-0.03	-0.10	-0.07	1.00		
24	0.00	0.00	-0.01	0.00	-0.01	-0.07	-0.05	-0.05	-0.01	-0.01	-0.02	-0.03	-0.04	0.09	-0.05	-0.06	0.01	0.02	.	-0.03	-0.10	-0.07	-0.22	1.00	
25	0.08	0.04	0.05	0.08	0.14	0.07	-0.05	-0.06	-0.01	-0.02	-0.01	-0.03	-0.01	0.00	-0.05	0.03	0.10	0.09	.	-0.05	-0.15	-0.11	-0.34	-0.34	1.00

Legend

Variable	ami8a	hf_1	pn_6	scip_inf_1	opccr	cpccr	acquired	acqexp	chgincosts	chgininpatient	chginoutpatient	typeofdeal	acquirertype
Number	1	2	3	4	5	6	7	8	9	10	11	12	13

Variable	Poppc_turban	_IacqXpoppc_1	locacq	lg10beds	gme	acute	govfed	govlocal	govstate	proprietary	volnpchurch	volnpprivate
Number	14	15	16	17	18	19	20	21	22	23	24	25

Appendix B.2 Correlation matrix—all variables, excluding type of deal and acquirer type and percent change in inpatient charges

Table 29 Highly correlated variables removed

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1.00																					
2	0.46	1.00																				
3	0.44	0.43	1.00																			
4	0.27	0.29	0.27	1.00																		
5	-0.05	-0.13	-0.11	-0.05	1.00																	
6	-0.01	-0.07	-0.07	-0.06	0.58	1.00																
7	0.00	0.05	0.06	0.02	-0.08	-0.03	1.00															
8	-0.03	0.03	0.02	-0.01	-0.09	-0.05	**0.72**	1.00														
9	-0.04	-0.02	0.01	0.01	-0.01	0.01	0.38	0.10	1.00													
10	-0.02	-0.05	-0.04	-0.04	0.02	0.02	0.05	0.03	0.03	1.00												
11	-0.01	-0.04	-0.04	-0.04	0.01	0.03	0.04	0.03	0.01	**0.64**	1.00											
12	0.03	0.01	0.01	-0.01	-0.25	-0.22	0.02	-0.01	0.09	-0.01	-0.01	1.00										
13	0.01	0.05	0.06	0.02	-0.08	-0.03	**0.99**	**0.69**	0.41	0.05	0.04	0.05	1.00									
14	0.04	-0.02	-0.01	0.03	-0.08	-0.26	-0.07	-0.08	0.00	-0.03	-0.02	0.31	-0.06	1.00								
15	-0.08	-0.08	-0.08	-0.05	0.04	-0.10	-0.02	-0.05	0.02	0.00	0.00	0.19	-0.02	0.41	1.00							
16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.						
17	0.00	0.01	0.01	0.00	0.00	-0.01	0.01	0.01	0.02	0.00	0.00	0.01	0.01	0.02	0.02	.	1.00					
18	-0.04	-0.03	-0.05	-0.02	0.10	0.07	-0.04	-0.03	-0.03	0.00	-0.01	-0.06	-0.04	-0.01	-0.02	.	-0.02	1.00				
19	-0.06	-0.06	-0.06	-0.03	0.09	-0.02	-0.03	-0.02	-0.02	0.01	0.00	0.05	-0.03	0.10	0.09	.	-0.01	-0.03	1.00			
20	-0.02	0.03	0.02	-0.06	-0.31	-0.08	0.19	0.19	0.02	0.01	0.03	0.04	0.18	-0.23	-0.17	.	-0.03	-0.10	-0.07	1.00		
21	0.00	0.00	-0.01	0.00	-0.01	-0.07	-0.05	-0.05	-0.06	-0.01	-0.02	0.09	-0.05	0.01	0.02	.	-0.03	-0.10	-0.07	-0.22	1.00	
22	0.08	0.04	0.05	0.08	0.14	0.07	-0.05	-0.06	0.03	-0.01	-0.01	0.00	-0.05	0.10	0.09	.	-0.05	-0.15	-0.11	-0.34	-0.34	1.00

Legend

Variable	ami8a	hf_1	pn_6	scip_inf_1	opccr	cpccr	acquired	acqexp	locacq	chgincost	chginoutpatient
Number	1	2	3	4	5	6	7	8	9	10	11

Variable	poppct_urban	_lacqXpoppc_1	lg10beds	gme	acute	govfed	govlocal	govstate	proprietary	volnpchurch	volnpprivate
Number	12	13	14	15	16	17	18	19	20	21	22

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VITA

Dawn McKell was born at Brooklyn-Jewish hospital in Brooklyn, NY, on June 5, 1955 and was the second child of Clarine Lorraine Douglas-Gilfillan and Edward Lionel Gilfillan. Her elder sister, Sandy A. Gilfillan-Cooper, resides in Virginia and is her only sibling. The first 20 years of Dawn's life were spent in the boroughs of Brooklyn, Manhattan, and Queens, where she attended catholic schools from first grade through her sophomore year of high school, when she transferred to public high school and graduated in 1973. On March 15, 1975, at 19 years of age, she married Paul McKell, who had recently joined the US Army. Shortly after marrying, she moved to Korea where she lived with her husband for 14 months before he was reassigned to Savannah, Georgia, where they welcomed their first child, Brian, into the world on October 21, 1976. Their second child, Bianca, was born on June 23, 1978, also in Savannah. Another reassignment took the family to Wiesbaden, Germany, where they lived for three years. During this assignment, Dawn worked as a Medical Technician in the radioimmunoassay section of a US military testing laboratory on Wiesbaden air base and eventually becoming the section supervisor. The family was reassigned to Fort Riley, Kansas, and, during this tour of her husband's duty, Dawn worked as a Medical Technician in a neuroendocrinology research laboratory in the Anatomy and Physiology Department at Kansas State University's veterinary medicine complex, performing research and assisting with grant proposals under the direction of Dr. S.K. Quadri. During this time, Dawn was the lead author of an abstract (McKell & Quadri, 1984) that she presented in poster format at a conference at Kansas University in Topeka. Upon moving from Kansas to El Paso, Texas, due to another reassignment, Dawn pursued her Bachelor of Science degree in Medical Technology, graduating magna cum laude from the University of

Texas at El Paso in 1988. Post-graduation in El Paso, she worked in two clinical hospital laboratories, Providence Hospital and William Beaumont Army Medical Center, respectively, which culminated in a rise to manager of the latter's Chemistry Department. During her tenure at William Beaumont Army Medical Center, Dawn participated in research related to fetal hemoglobin, which produced two published articles that she co-authored (Pearson et al., 1998; Pearson et al., 1994). Her career path then took her into diagnostic clinical laboratory sales; this began as an entry-level technical position attached to sales and culminated in an Integrated Healthcare Network Director position at the company, where she worked for 17 years, serving in various positions including direct sales for multiple product lines and sales management. She then took a hiatus from the work environment to pursue post-graduate study in the form of a Master's in Business Administration with a concentration in Healthcare Administration from South University, graduating magna cum laude in 2013. Dawn chose to pursue an Executive Doctorate in Business from Georgia State University in 2013, and returned to a clinical diagnostic sales career in 2014 while continuing her studies. She currently serves as the National Manager of Group Purchasing Organizations (GPOs), Integrated Delivery Networks (IDNs), and Corporate Accounts for a clinical diagnostic instrument manufacturer. Dawn resides at 11491 Carl Parker Rd., Hampton, GA 30228, which is just outside of the Atlanta metro area.